Western Sustainable Agriculture Research and Education

Annual Report 1999

Acknowledgements:

Leaders of funded grants prepared the project summaries in this report. Additional writing and editing by Kristen Kelleher and Sharyl McGrew. Editorial review led by V. Philip Rasmussen, Ph.D. Graphic design by Marianne Post and Kellie Kolenski, UC Davis Repro Graphics. Photographs by Cynthia Vagnetti and Jeff Caven, with support from Western SARE.

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Western Region

Sustainable Agriculture Research and Education

How to Use This Binder

Western Region
Sustainable Agriculture Research and Education

How to Use this Binder

If you have received this binder-style Annual Report 1999, you are a key SARE colleague and friend.

This binder was designed to be used in a variety of ways. It can act as a desk reference for you by providing current results from active Western SARE projects and efforts. Or, it can be reproduced (in part or full) to meet the needs of your clientele or colleagues.

The binder publication allows you to browse through project information from your area, or review research results about crops or operations of particular interest. The Western SARE program now has more than 60 active research, education and professional development projects each year, as well as more than 30 new farmer- and rancher-led efforts. The tabs of the binder should make it easier for you to maneuver through this comprehensive piece.

Reproductions of project summaries, or other sections of the publication, work well as handouts for meetings or conferences, or for working directly with producers or others who are interested in a sustainable agriculture topic. Each page has been formatted and printed in a style that can be easily photocopied. Or, the entire publication can be quick-printed by a local printer using the binder pages provided.

If you do reprint the publication (in part or full), we suggest that you use recycled paper, and print front-and-back. The binder pages enclosed are one-sided to provide field staff with the option of photocopying pages either way (if available equipment demands it.)

On-Line: Annual Report 1999 and the National Project Database

The contents of this Annual Report 1999 will also be on the region's Web site soon at **http://wsare.usu.edu/**. We hope you will go to the site and review this and other information products on-line. Also, a national, searchable database of SARE projects is accessible via the Internet at **www.sare.org**

Thank you for your interest in sustainable agriculture and Western SARE. If you have any questions about how to use this binder, contact communications specialist Kristen Kelleher at (530) 752-5987 or kkelleher@ucdavis.edu

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Sustainable Agriculture Research and Education

Introduction

The 1999 Annual Report provides an overview of active Western SARE-supported research, educational and professional development efforts.

On the brink of a new millennium, I am pleased to introduce this innovative work. I am confident that it will have a positive and sustaining effect on the nation's food and fiber supply in the 21st century.

The Western SARE program in 1999 finds itself in strong shape, with consummate leadership, active and diverse participation in its competitive grants efforts and well-prepared staff.

For the first time, a farmer was elected chair of the region's governing Administrative Council in summer 1998. Larry K. Thompson, of Boring, Oregon, will lead the Western effort for a two-year period. As he has demonstrated during his first nine months in office, he will usher in a new century of sustainable agriculture research and education with enthusiasm, vibrant volunteer energy, and a grassroots understanding of producers' needs and desires. (For additional background about Larry, and two new staff appointments, see the "New Regional Leadership and Staff" section below.)

To mark the change of the century, and highlight the evolving agricultural practices fostered by Western SARE, a regional committee has already begun planning a major conference in March 2000. The event will draw 500 farmers and ranchers, field advisors, scientists, policy-makers, sustainable agriculture advocates, and agri-business representatives to Portland, Oregon from throughout the Western U.S. to consider region-wide topics. The conference will gather experts in the field, provide a venue for sharing research results and help to build momentum for more sustainable agriculture successes. I hope to see you at this exciting event.

As the year 2000 nears, we face the appropriations challenge of a balanced federal budget. It remains essential to inform our supporters and sponsors about the accomplishments of the effort. Day-to-day, however, Western SARE's primary goals are to expand knowledge and adoption of sustainable agriculture through its well regarded competitive grants programs; expand information-sharing and networking in-person, in print and via electronic avenues; and include producers in regional decision-making and execution of research, professional development and educational work.

The 1999 Annual Report includes:

- Two-page summaries of each project's progress and results,
- An overview of the farmer- and rancher-led projects,
- A table of recently-funded grants (1998 and 1999),
- A sustainable agriculture resource list, and
- Grant application information.

The rest of this section also provides you with: more background on Administrative Council Chair Larry Thompson and appointments of new staff members; a historical "snapshot" of the types of grants funded from 1995-1998; an overview of the 1998 competitive grants process; program

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efforts of note; and, background information about Western SARE, with a list of Administrative Council members.

I hope this information package is helpful to you in your efforts to expand understanding and practice of sustainable agriculture. Visit the Western SARE Web site at **http://wsare.usu.edu/** for on-line versions of this and other information products.

Thank you for your interest in sustainable agriculture and Western SARE.

Sincerely,

V. Philip Rasmussen, Ph.D., regional coordinator

New Regional Leadership and Staff

Three major leadership and staff appointments took place in 1998: Administrative Council Chair, Professional Development Program (PDP) Coordinator, and Deputy Coordinator.

Larry K. Thompson, a second-generation berry farmer from Boring, Oregon, was elected the first farmer **Chair** of the Western SARE **Administrative Council**. According to Thompson, when he considers sustainable agriculture policy, or research and education priorities, his foremost question is "Does it work at the grower level?" Thompson has also stated that during his tenure as chair he wants to look at how much producers are employing the sustainable agriculture science sponsored by Western SARE and shore up the path between research and field use.

The Thompson family began growing berries in Gresham, Oregon in 1947. The farm has since expanded to its current size of 100 acres and 27 vegetable and fruit crops. Larry Thompson and his father used cover crops early on to stem erosion, but found they had the positive by-product of very little insect or fungus problems.

The land is farmed today by Larry and his wife Kathy. They cultivate a high number of beneficial insects through cover cropping and other techniques, apply no chemical insecticides or fungicides, and use about a quarter of the recommended amounts of herbicides for weed control. Thompson has also shifted the marketing of his crops from processors to fresh market. Thompson believes that how he makes his living has to coincide with his goals as a caretaker of the land, and as a contributing member of the community where he and his family live and farm.

After an open, competitive search, **Jim Freeburn** of the University of Wyoming Cooperative Extension Service was appointed to the post of regional **PDP Coordinator** in fall 1998. Freeburn has extensive agricultural background and knowledge of the Western U.S. He most recently acted as County Extension Director and Extension Educator for the University of Wyoming. He is leading the regional PDP effort from the University of Wyoming's Research and Extension Center in Torrington.

According to Freeburn, one of his strengths is his ability to relate to producers on a personal level. His primary work has been in crop and livestock production, agricultural marketing, natural resources and community development. Freeburn will develop PDP calls for proposals and coordinate grant technical reviews, among other networking and leadership duties.

Also in late 1998, **Robert (Bob) Newhall** of Utah State University (USU) was appointed **Deputy Coordinator** of the program. Newhall has been a Utah state extension leader for sustainable agriculture for six years; he is continuing in this role as he takes on additional responsibilities for

Western SARE. He is an extension research associate at USU, specializing in soil and water conservation.

Newhall will oversee the development of calls for proposals for both SARE and Farmer/Rancher grants. He will also coordinate technical reviews of these competitive grants programs and be involved in general program issues. According to Newhall, activities of special interest to him are teaching and hands-on lab work on erosion control. His research and extension interests include crop rotations and alternative crops, land-use, community planning, farmland preservation, agricultural effluent water use and low-level remote sensing.

Competitive Grant Programs

Western SARE has three competitive grants efforts: Sustainable Agriculture Research and Education, SARE, grants, which fund research and education projects; Professional Development Program grants, which support educational opportunities for Extension, Natural Resources Conservation Service (NRCS) and other agricultural personnel; and, the Farmer/Rancher Research Grant effort, which provides competitive grants to Western producers to test their field questions or overcome local challenges.

In the **1998** round of competitive grant selections, just over **$2 million** in awards was disbursed to universities, farmers and ranchers and organizations to further knowledge and adoption of sustainable agriculture. More than a third of the grant work involved livestock, and almost another third focused on sustainable agriculture approaches for tropical climates. The latter demonstrates the effectiveness of the region's outreach initiatives to the Pacific Islands. Also, the number and caliber of proposals from the Native American community grew significantly during this selection cycle.

Other projects funded in 1998 expand knowledge of soil quality, alternative crops, organic marketing techniques, agroforestry and natural buffers, and minimum tillage practices for cotton, among other topics. One California project is targeting professional development in sustainable agriculture to private pest control advisors and agricultural consultants.
Specifically:

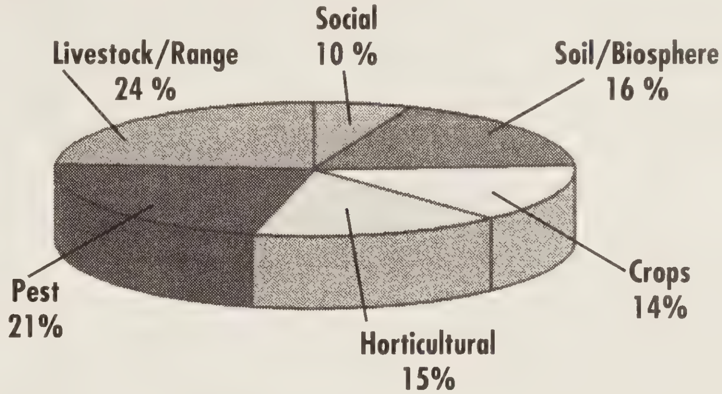
- More than $1.3 million was awarded to research and education (also known as SARE) projects. The fund total represents 10 projects that were selected from 73 submitted proposals. The overarching goal of this effort is to increase knowledge of agricultural practices that are economically viable, environmentally sound and socially acceptable. Farmers or ranchers are directly involved in the planning or implementation of projects, whether they be university-based or on-farm trials.
- Roughly $404,000 was allocated to professional development projects, supporting seven projects from a possible 15. In addition, $164,000 was split among state Cooperative Extension programs in the West to further diverse state-level education and outreach activities primarily aimed at agriculture professionals.
- Just over $143,000 was shared by 31 farmers and ranchers, who will lead research and community development projects that will test their "in the field" sustainable agriculture questions, or grapple with a related community or producer challenge. The grantees were chosen from among 104 applications.

For an on-line, state-by-state list of **1998** or **1999** competitive grant selections for research and education, professional development or producer grants, go to **http://wsare.usu.edu/docs/newsrel.htm** and click on the appropriate news release title.

For some historical perspective, the following pie chart illustrates the diversity of subjects of Western SARE grants from 1995 through 1998.

The chart shows seven grant subject areas, and the percent amount of dollars awarded to each category.

1995-1998 Type of SARE Grants



Program Efforts of Note

❖ Western Sustainable Agriculture Conference, March 2000

"Farming and Ranching for Profit, Stewardship and Community" will be the theme of a Western SARE-sponsored event that is scheduled for March 7-9, 2000 in Portland, Oregon. Conference planning is well underway, headed by a committee of scientists, educators, producers and state-level agricultural professionals from throughout the Western U.S. The three-day conference will highlight the methods and outcomes of diverse research and education projects funded by the regional program — including university-based, on-farm and producer-directed work. The role of non-profit organizations and public policy in promoting sustainable agriculture will also be discussed, as well as marketing strategies, and the benefits of involving farmers and ranchers in agricultural research. The event will also offer a number of information-sharing opportunities.

Conference co-chairs are John Luna, Oregon State University (OSU), Sean Swezey, University of California Sustainable Agriculture Research and Education Program (UC SAREP) and David Granatstein, Washington State University. Coordinator Mary Staben, OSU, welcomes questions at stabenm@bcc.orst.edu or (541) 737-5437.

❖ Evaluation

The region has begun formal evaluation activities to collect data on the accomplishments and on-the-ground outcomes of its funded research and education projects. The work adds to the findings of the Western SARE-sponsored opinion survey of its stakeholders fielded in 1997. Both endeavors provide information about the attitudes and opinions of key SARE clientele, and begin to track the effectiveness of the program over the long-term.

The current evaluation effort will focus on six or seven selected SARE (research and education) projects. Selected project coordinators will be asked to identify producers who have adopted, or have considered adopting a new technique or technology that was examined as part of a SARE project. There will be questions about transfer of information to end-users, and the field impacts of research trials.

❖ Joint Meeting of Administrative Council and PDP State Leaders Held in Summer 1998

A major gathering occurred in August 1998: the first joint meeting of the Administrative Council with Professional Development Program (PDP) state leaders and members of the land-grant Western Coordinating Committee on Sustainable Agriculture (WCC-67). The interaction of the groups

spurred fruitful information-sharing, better understanding of state-level professional development activities, networking and goal-setting among the participants. A field tour of Northern Nevada sustainable agriculture projects highlighted local efforts from suburban Reno to the Carson Valley. In August 1999, PDP state leaders will meet in tandem with WCC-67 representatives in Tucson, Arizona. For advance or follow-up information about this year's meeting, contact Jim Freeburn, PDP Coordinator, at SARE@agmail.uwyo.edu or (307) 532-8892.

❖ Web Site Expansion

For the first time, the region's 1997-98 Annual Report ("The Tenth Year") was made available on the Web site in both "browser" and searchable formats. The "browser" version matches the print edition in design and content, with inter-linking features that bond it to the larger Web site in many ways. Users can now review the document in a "book" style, and can link directly to the national SAN/SARE and other Internet sites referenced in the product. The report is also available in a searchable, Folio software-based format. The 1999 Annual Report will follow suit and be accessible in both formats as well. Go to **http://wsare.usu.edu/** to see these and other regional publications and databases.

About Western SARE

Western SARE is led by an Administrative Council of scientists, farmers and ranchers, business leaders and administrators, in cooperation with the USDA SARE office and Cooperative State Research, Education and Extension Service.

Administrative Council members and officers in 1998 and 1999:

- Larry Thompson, chair (term: August 1998 to August 2000), farmer, Thompson Farms, Boring, Oregon
- Jerry Schickedanz, chair (term: August 1997 to August 1998), New Mexico State University, Las Cruces, New Mexico
- Mike Somerville, state conservationist, USDA Natural Resources Conservation Service, Phoenix, Arizona
- Robert D. Heil, Colorado State University, Ft. Collins, Colorado
- Susan Matsushima, farmer, Alluvion, Inc., Haleiwa, Hawaii
- Antoinette Betschart, USDA Agricultural Research Service, Albany, California
- Kathleen A. McCarthy, U.S. Geological Survey, Portland, Oregon
- Mark W. Frasier, rancher, Woodrow, Colorado
- Kai Siedenburg, California Sustainable Agriculture Working Group, Santa Cruz, California (until March 1999)
- Dennis Teranishi, Hawaiian Host Inc., Honolulu, Hawaii
- Meta Boyer, Montana State Department of Agriculture, Helena, Montana
- Billy Dictson, Cooperative Extension, New Mexico State University, Las Cruces, New Mexico
- Jill Shore Auburn, USDA program leader for Sustainable Agriculture, SARE director
- Harry W. Wells, U.S. EPA

Since 1988 through federal fiscal 1998, the U.S. Congress has allocated more than $92 million to the federal SARE effort; Western SARE has received $20.7 million in funds.

The SARE program, which was authorized by Congress in the 1990 and 1996 Farm Bills, is managed regionally by four councils: Western, North Central, Northeast and Southern United States.

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These committees of scientists, producers and administrators represent a variety of interests and provide local leadership to research and training efforts. Regional councils operate in cooperation with the USDA SARE office and the Cooperative State Research, Education and Extension Service.

V. Philip Rasmussen, a soil scientist at the program's host institution of Utah State University, is the regional coordinator of Western SARE. Robert Newhall, also of Utah State University, is deputy coordinator. The professional development program is led by Jim Freeburn, coordinator, from the University of Wyoming. Al Kurki of the National Center for Appropriate Technology, NCAT, Montana, is co-coordinator of the PDP effort.

The region includes Alaska, American Samoa, Arizona, California, Colorado, Guam, Hawaii, Idaho, Micronesia, Montana, Nevada, New Mexico, N. Mariana Islands, Oregon, Utah, Washington and Wyoming.

Go to **http://wsare.usu.edu/** for calls for proposals, news announcements, publications and archived project progress reports.

Who to contact at Western SARE:

❖ Western SARE Headquarters, Utah State University

http://wsare.usu.edu/
Phil Rasmussen, regional coordinator; Bob Newhall, deputy coordinator; and Florence Hinck, administrative assistant
phone: (435) 797-2257; fax: (435) 797-3376
wsare@mendel.usu.edu

Contact about: calls for proposals; SARE and Farmer/Rancher grants; general policy and program goals; contracting and grants administration.

❖ Professional Development Program, University of Wyoming Research and Extension Center

Jim Freeburn, PDP coordinator; Lori Schafer, regional assistant
phone: (307) 532-8892
SARE@agmail.uwyo.edu
Contact about: PDP grants administration; PDP goals, policies and planning.
Al Kurki, PDP co-coordinator
phone: (406) 475-3729
akurki@mcn.net

❖ Public Information Office, University of California, Davis

Kristen Kelleher, communications specialist
phone: (530) 752-5987
kkelleher@ucdavis.edu
Contact about: news media questions, publications and information products, Sustainable Agriculture Network outreach materials.

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Sustainable Agriculture Research and Education

Timelines for Grant Programs

Western SARE administers three grants efforts: the original Sustainable Agriculture Research and Education, SARE, program, which strives to expand scientific knowledge of sustainable farming and ranching practices; the Professional Development Program, which aims to educate agricultural professionals about sustainable agriculture; and, the Farmer/Rancher Research Grant effort, which supports producer-directed research and community development activities.

All grant programs operate on an annual (once-a-year) cycle and have a competitive selection process. General timelines for releases of calls for proposals and corresponding due dates:

- SARE: call for proposals is released in mid-summer; proposals due in early fall.
- Professional Development Program: call for proposals released in tandem with SARE in mid-summer; proposals due in the fall.
- Farmer/Rancher Research Grants: call for proposals released in the fall; deadline for submission in mid-January.

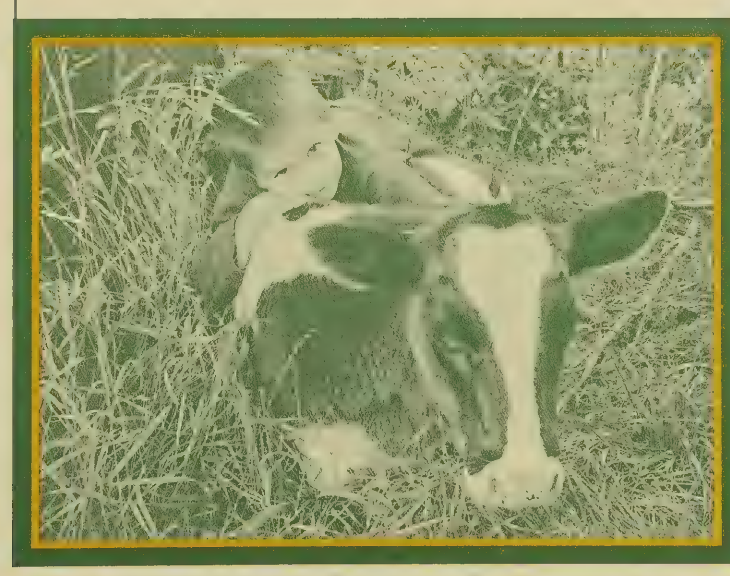
How to Receive a Call for Proposals & Where to Apply

Calls for proposals are automatically mailed to those on the distribution list at the time the call is released, or sent out individually during the application period. To add your name to the early distribution list, or to get an application after the release date, contact the regional headquarters:

Western SARE
Utah State University
Agricultural Science Building, Room 322
4865 Old Main Hill
Logan, UT 84322-4865
(435) 797-2257
(435) 797-3376
wsare@mendel.usu.edu

Calls for proposals can also be down-loaded from the Western SARE Web site at **http://wsare.usu.edu/**

Please specify the grant program(s) in which you are interested.



Western SARE

Sustainable Agriculture Resources

Sustainable Agriculture Resources

Western Region

Sustainable Agriculture Research and Education

Western SARE aims to get research results and practical information on sustainable agriculture to those who need it. Following are resources for information and "how-to" techniques. This listing is also available on-line at **http://wsare.usu.edu/** by clicking on "Publications and Databases," and then selecting "Sustainable Agriculture Resources."

For a national clearinghouse of resources, see "The Sourcebook of Sustainable Agriculture" in print (see SAN section below) or on-line at **www.sare.org**.

If follow-up information is not given, contact the public information office at (530) 752-5987 or kkelleher@ucdavis.edu.

The list is organized into the following categories:

Organizational Resources:

- Western SARE
- Sustainable Agriculture Network (SAN)
- University of California (UC) SAREP

Resources from Western SARE Projects (By Topic):

- Professional Development
- Cover Cropping
- Farming and Ranching Systems
- Ranching, Livestock/Crop Systems, Dairy
- Insect and Weed Control
- Marketing, Economics
- Producer Research
- Soil Quality and Fertility
- Agroforestry
- Tropical Agriculture
- Pacific Northwest Agriculture
- Protecting Natural Resources
- Dryland Farming
- Social Science & Sustainable Agriculture
- Research Design & Community Participation
- Permaculture
- Solarization
- Key Web Sites and List-Serve

ORGANIZATIONAL RESOURCES

Western SARE

Go to the Web site address provided or contact the public information office for printed materials.

- **Annual Reports (1994-95, 1996 and 1997-98)**—On-line at **http://wsare.usu.edu** by clicking on the "Publications and Databases" button
- **Professional Development Program brochure**—A primer on training and educational programs aimed at agriculture professionals, and a contact list of designated state leaders for sustainable agriculture.
- **National SARE Project Highlights (1993 – 1999)**—Brief and colorful highlights of research across the nation.
- **Calls for proposals**, news releases, and other resources available on-line at **http://wsare.usu.edu**

Sustainable Agriculture Network (SAN)

The Sustainable Agriculture Network is the outreach arm of the SARE program. A number of resource publications, handbooks and electronic materials, and networking opportunities are available. A national database of SARE projects and other information is also available on-line at **www.sare.org**

Handbooks and FREE bulletins include:

- **Steel in the Field: A Farmer's Guide to Weed Management Tools**—A farmer-oriented handbook with 45 drawings accenting technical descriptions on tools' roles, designs and costs. Index, contact list, tool source list. $18
- **Managing Cover Crops Profitably**—Explores how and why cover crops work, and provides how-to build cover crops into farming systems. $19
- **The Source Book of Sustainable Agriculture**—A national guide of handbooks, Web sites, newsletters, conference proceedings, bulletins, videos and more that focus on sustainable agriculture topics. Each of the more than 500 entries has a detailed product description and ordering information. Price: $12
- **The Sustainable Agriculture Directory of Expertise**—(In print or on computer diskette/Folio software) A list of over 700 people and organizations willing to share their expertise in sustainable agriculture. Price: $18.95
- **The Real Dirt**—Farmers tell about organic and low-input practices in the Northeastern U.S. Price: $13.95
- **Profitable Dairy Options: Grazing • Marketing•Nutrient Management**—A brochure on sustainable dairy farming which focuses on rotational grazing, new marketing approaches and some references for feedlot-oriented systems. FREE.
- **Diversify Crops to Boost Profits and Stewardship**—A bulletin about how to boost profits and longevity of operations through crop diversification. FREE.

To order, send a check or purchase order (or written request) to Sustainable Agriculture Publications, Hills Building, University of Vermont, Burlington, VT, 05405-0082. For bulk discounts and rush orders, phone (802) 656-0471 or e-mail nesare@zoo.uvm.edu. For general information about SAN, contact coordinator Andy Clark at (301) 504-6425, or san@nal.usda.gov.

UC SAREP

- **Sustainable Agriculture** (A publication of the University of California's Sustainable Agriculture Research and Education Program.) This FREE newsletter provides practical information, announcements and technical and research summaries. For a list of other materials or to subscribe, contact UC SAREP at (530) 752-7556.

RESOURCES FROM WESTERN SARE PROJECTS BY TOPIC:

All of the following resource materials were developed with support from Western SARE regional grants, except the noted SAN publications.

Professional Development

- **SATCHEL: Sustainable Agriculture Training Curriculum Handbook for Educators & Leaders**—A practical kit for designing a professional development program in sustainable agriculture. The book features a focus on tried-and-true collaborative learning techniques. Published by the Alternative Energy Resources Organization (AERO). $15 (or $10 for AERO members). Contact: AERO at (406) 443-7272.
- **Sustainable Agriculture Telecast/Teleconference: Training Our Trainers** (VIDEO)—A videotape of the interactive teleconference that provided an initial overview of sustainable agriculture techniques and issues for professional development of agricultural professionals. Contact: Joe Hiller, University of Wyoming Cooperative Extension Service, at (307) 766-5479 or 766-2196.
- **Introduction to Sustainable Agriculture for the Western States** (VIDEO)—A 10-minute film to educate agriculture professionals and the public about the value and basic principles of sustainable agriculture. Contact: Joe Hiller, University of Wyoming Cooperative Extension Service, at (307) 766-5479 or 766-2196.

Cover Cropping

- **Managing Cover Crops Profitably**—A comprehensive handbook that explores how and why cover crops work, and provides how-to build cover crops into farming systems. Price: $19. See SAN section for ordering information or go to **www.san.org**
- **Using Cover Crops in Oregon**—Contact Oregon State University Extension Service at (541) 737-2513 or go to **http://eesc.orst.edu/agcomwebfile/edmat/** and search on EM 8704.
- **Characteristics of Cover Crops in Western Washington**—A fact sheet by the Washington State University Extension Service. Contact: Nancy Liggett, WSU Skagit County Extension, at (360) 428-4270.
- **Creative Cover Cropping in Perennial Farming Systems** (VIDEO)—How to use cover crops in orchards and vineyards to improve soil fertility, enhance pest control and provide other benefits. Price: $20. Contact: UC SAREP, University of California, Davis, CA, 95616, or phone (530) 752-7556.
- **Creative Cover Cropping in Annual Farming Systems** (VIDEO)—Cover cropping in row and field crop systems. Price: $20. Contact: UC SAREP at same address as above.

Farming and Ranching Systems

- **The Organic Wheat Production Handbook**—Practical information for growing organic wheat, from planting to harvest. The handbook was written for New Mexico farmers but is relevant for organic wheat production throughout the U.S. Price: $10 (including shipping and handling). Contact (and make checks payable to): Kernel of Life, Organic Wheat Production Handbook, 200-B Callecita Place, Santa Fe, NM, 87501.
- **Learning from the BIOS Approach, A Guide for Community-Based Biological Farming Programs**—The guide gives an overview of on-the-ground operations, and identifies lessons learned while implementing this style of program. The guide is FREE for a limited time. Contact: Carla at the Community Alliance with Family Farmers at (530) 756-8518, ext. 15 or via e-mail at caff@caff.org.
- **Pleasant Grove Farms: A Case Study (VIDEO)**—A case study of a northern California family farm that has transitioned to sustainable practices. Length: 22 minutes. Price: $20. Contact: Reference # V/94-Z, Communication Services, 1441 Research Park Drive, Room 131, University of California, Davis, CA, 95616, or phone (530) 757-8980.
- **UC Sustainable Agriculture Farming Systems Project (VIDEO)**—Length: 22 minutes. The video provides an overview of the long-term University of California, Davis-based sustainable farming systems project, including background on experimental design, the participatory research process and current findings. Price: $15. Contact: SAFS Project, Dept. of Agronomy & Range Science, University of California, Davis, CA, 95616. Phone: (530) 752-8940.
- **Sustainable Farming Systems Project News Bulletin**—Reports emerging results from this long-term project, which is comparing organic, low-input and conventional production systems for key northern California crops, such as processing tomatoes. Contact: SAFS Project (at address and phone above). The bulletin is also available on the project's Web site at **http://agronomy.ucdavis.edu/safs/home.htm**.
- **Sustainable Agriculture Perspectives from Across America: Introduction to Concepts and Principles, 1996 (VIDEO)**—A 23-minute video suited for professional development training venues. To order, e-mail SARE002@unlvm.unl.edu or call (402) 472-7081 for a FREE copy while supplies last.

Ranching, Livestock/ Crop Systems, Dairy

- **Profitable Dairy Options: Grazing • Marketing • Nutrient Management**—A brochure on sustainable dairy farming that focuses on rotational grazing, new marketing approaches and some references for feedlot-oriented systems. FREE. For ordering information, see SAN section above or go to **www.sare.org**
- **Stream in Riparian Area Management: An Overview (VIDEO)**—A home study video course for ranchers to increase their knowledge of riparian management methods. Available on a loan basis. Contact: Tara Fisher, Montana State University, at (406) 994-2362.
- **Managing Cattle Grazing in Riparian Areas**—An extension publication. Contact Extension Wildlife Specialist Jim Knight, Montana State University, at (406) 994-5579.
- **Liquid Manure Application to Cropland**—Livestock Series No. 1.222, Colorado State University Cooperative Extension, (970) 498-6000
- **Liquid Manure Management**—Livestock Series No. 1.221, Colorado State University Cooperative Extension, (970) 498-6000
- **Feedlot Manure Management**—Livestock Series No. 1.220, Colorado State University Cooperative Extension, (970) 498-6000

- **Horse Manure: A Renewable Resource**—Livestock Series No. 1.219, Colorado State University Cooperative Extension, (970) 498-6000
- **Cattle Manure Application Rates Table**—Crop Series No. 0.560, Colorado State University Cooperative Extension, (970) 498-6000
- **Manure management information** and more, go to "Colorado Soils" at **www.colostate.edu/Depts/SoilCrop/extension/Soils/**
- **"How To" Monitor Rangeland Resources, (Level I, Beginning and Level II, Advanced)**—University of California Cooperative Extension. Price: $30 (plus $4 for shipping and handling). Contact: Rhonda Gildersleeve, UCCE Inyo-Mono Counties, 207 W. South St., Bishop, CA, 93514, (760) 873-7854. Videos also available.
- **Crop and Livestock Production Systems for Land in the Conservation Reserve Program, Progress Reports**—New Mexico State University Cooperative Extension and Agricultural Experiment Station. Contact: Rex Kirksey, New Mexico State University, Agricultural Science Center, 6502 Quay Road, AM.5, Tucumcari, NM, 88401.
- **Nutrient Management for Dairy Production: Dairy Manure as a Fertilizer Source**—Extension Bulletin #EM 8586, Oregon State University Extension Service, Corvallis, OR.
- **California Grazing Academy (AUDIO TAPE SERIES)**—The tapes provide follow-up support to Grazing Academy alumni and introduce all ranchers to the principles and practices of controlled grazing. (Related to a SARE project on this topic.) For cost and ordering information, contact Roger Ingram, University of California Cooperative Extension at (530) 889-7385 or rsingram@ucdavis.edu.
- **California Grazing Academy Web site** (see above). Go to **www.foothill.net/~ingram**
- **Proceedings of Livestock Health and Nutrition Alternatives: A Western States Conference**—Contact: AERO at 25 So. Ewing, Suite 214, Helena, MT, 59601. Phone: (406) 443-7272.
- **Sustainability of Range Livestock Production Systems in the West**—proceedings of a September, 1994, regional conference. Sponsored by Montana State University, MSU Extension and Western SARE.

Insect and Weed Control

- **Steps to Successful Trap Crop Establishment**—University of Wyoming Extension bulletin. Contact David Koch at (307) 766-3242 or fax (307) 766-5549.
- **The Trap Crop Alternative**—University of Wyoming Extension bulletin. Contact David Koch at (307) 766-3242 or fax (307) 766-5549.
- **Steel in the Field: A Farmer's Guide to Weed Management Tools**—A farmer-oriented handbook with 45 drawings accenting technical descriptions on tools' roles, designs and costs. Index, contact list, tool source list. $18. See SAN section for ordering information or go to **www.san.org**

Marketing , Economics

- **Abundant Montana**—A directory of Montana agricultural products to build the identity of Montana-grown products. For information, contact AERO at (406) 443-7272.
- **Marketing Sustainable Agriculture: A Promoter's Toolbox**—Methods for encouraging the adoption of sustainable agriculture among growers. Length: 77 pages. Price: $14.00. Contact: Publication #3367, Agricultural Information & Publications, Communication Services, University of California, Davis, California, 95616-8511, or phone (530) 757-8930.

- **1992 Alternative Crop Rotation Enterprise Budgets**—Whitman County, Washington. Contact: Department of Agricultural Economics, Department of Crop and Soil Sciences, Cooperative Extension, Washington State University, Pullman, WA, 99164-6420.
- **Western Farm Management Extension Committee, Total Resource Budget Compendium** — August 1992

Producer Research

- **On-Farm Testing: A Grower's Guide**—Contact: Cooperative Extension, College of Agriculture & Home Economics, Washington State University, Pullman, WA, 99164-6420.

Soil Quality & Fertility

- **Soil Quality Topics: A Selection of Resources for Education and Extension**—A comprehensive resource binder to enhance the expertise of extension professionals on soil quality and health. The particular focus of this product is the growing interest in more holistic aspects of soil quality, and the view that soil is more than just a medium for plant growth. Price: $30 (including shipping and handling; CA residents add $2.18 sales tax). Contact the University of California (UC) SAREP office at (530) 752-7556.
- **Willamette Valley Soil Quality Card (companion guide below)**—A tool to help farmers assess the quality of their soil. Contact Oregon State University Extension Service at (541) 737-2513 or go to **http://eesc.orst.edu/agcomwebfile/edmat/** and search on EM 8711.
- **Willamette Valley Soil Quality Card Guide (companion to above)**—A companion guide to the soil quality card. Contact Oregon State University Extension Service at (541) 737-2513 or go to **http://eesc.orst.edu/agcomwebfile/edmat/** and search on EM 8710.
- **Composting: A Tool for Western Agriculture (VIDEO + Resource Notebook #1)**—Video version of satellite teleconference on agricultural composting. Companion notebook provides information and references. Video price: $10 . Notebook price: $10. To order, contact: Barb Smith, University of Idaho, at (208) 885-6183 or bsmith@uidaho.edu
- **Compost: A Resource for Western Agriculture (VIDEO + Resource Notebook #2)**—Video of second satellite teleconference on agricultural composting. Diverse western U.S. examples and case studies shown. . Companion notebook provides information and references. Video price: $10 . Notebook price: $10. To order, contact: Barb Smith, University of Idaho, at (208) 885-6183 or bsmith@uidaho.edu
- **The Composting Process**—Go to **http://www.ext.usu.edu/publica/agpubs.htm** and click on AGWM-01.
- **Land Application of Biosolids, A Guide for Farmers**—Go to **http://www.ext.usu.edu/publica/agpubs.htm** and click on AGWM-02.
- **Backyard Composting in Utah**—Go to **http://www.ext.usu.edu/publica/gardpubs.htm** and click on Compost 01.
- **Using Compost in Utah Gardens**—Go to **http://www.ext.usu.edu/publica/gardpubs.htm** and click on Compost 02.
- **Using Compost in Utah Turf Applications**—Go to **http://www.ext.usu.edu/publica/gardpubs.htm** and click on Compost 03.
- **Using Mulches in Utah Landscapes and Gardens**—Go to **http://www.ext.usu.edu/publica/gardpubs.htm** and click on Compost 04.

- **Proceedings of AERO's Soil-Building Cropping Systems Conference**—Contact: Alternative Energy Resources Organization (AERO), 25 So. Ewing, Suite 214, Helena, MT, 59601. Phone: (406) 443-7272.

Agroforestry

- **Nitrogen Fixing Tree Start-up Guide**—Free reproduction for educational purposes is encouraged. Down-load from **www.agroforester.com**
- **A Guide to Orchard Alley Cropping for Fertility, Mulch and Soil Conservation**—A how-to guide on planning, installing and managing alley cropping in orchards. Free reproduction for educational purposes is encouraged. Go to **www.agroforester.com**
- **Fire & Water Restoration of a Pinyon-Juniper Watershed (VIDEO)**—Contact: Howard Shanks, RC&D Coordinator, Box 457, Carrizozo, NM, 88301. Phone: (505) 648-4293 or -2941.
- **Restoration of A Pinyon-Juniper Ecosystem**—(Companion to above video). Contact above.
- **Fire & Water: Restoring the Promise (VIDEO)**—A 15-minute video that provides supplementary information to the first "Fire & Water" video mentioned above. Contact Howard Shanks as detailed above.

Tropical Agriculture

- **Taro Production Systems In Micronesia, Hawaii and American Samoa**—Contact: L. Ferentinos and A. Vargo, American Samoa Community College, Pago, Pago, AS.
- **Sustainable Taro Culture in the Pacific, The Farmers Wisdom**—Contact: Pacific Agricultural Development Office, Tropical Energy House, East-West Road, University of Hawaii, Honolulu, HI, 96822. Fax: (808) 956-6967.
- **Nourish The Roots Gather The Leaves - Sustainable Taro Culture in the Pacific (VIDEO)**—American Samoa Community College, Pago, Pago, AS.

Pacific Northwest Agriculture

- **The Skagit River: The Nitrogen Story**—A fact sheet by the Washington State University Extension Service. Contact: Nancy Liggett, WSU Skagit County Extension, at (360) 428-4270.
- **A Resource Guide to Sustainable Agriculture in Washington and Oregon** —A resource guide of more than 200 pages tailored to this region. No charge while supply lasts. Contact: Guide # EM8531, Publications Orders, Oregon State University, at Administrative Services, A422, Corvallis, OR, 97331-2119, or phone (503) 737-2513.
- **Farming For Profit and Stewardship, Sustainable Agriculture in the Pacific Northwest**—Proceedings of the West Cascade Conference for 1989, 1990, 1991.
- **Farming For Profit and Stewardship, Sustainable Agriculture in the Pacific Northwest, 1989**—Proceedings of the Tri-State symposium. Contact: Department of Agronomy and Soil Science, Washington State University, Pullman, WA, 99164-6420.
- **Issues in Sustainable Agriculture: A Study of Horticultural Producers in Western Oregon and Washington**
- **Whole Farm Case Studies of Horticultural Crop Producers in the Maritime Pacific Northwest**—Contact: Publications Orders, Oregon State University, Administrative Services, A422, Corvallis, OR, 97331-2119, or phone (503) 737-2513.

Protecting Natural Resources

- **Washington Agriculture: Sustaining Water, Land and People, Clean Water for Washington**—Contact: Bulletins Office, #EB1634, Cooperative Extension, Washington State University, Pullman, WA, 99164-5912.
- **Protecting Ground Water From Agricultural Chemicals: Alternative Farming Strategies For Northwest Producers**—Contact: AERO, 25 So. Ewing, Suite 214, Helena, MT, 59601. Phone: (406) 443-7272.
- **Cover Crops for Clean Water**—Proceedings of an international conference. Edited by W. L. Hargrove; authored by J. R. Sims and A. E. Slinkard.

Dryland Farming

- **Mininum- and No-till in Dryland Washington**—1998 conference proceedings, detailed case studies of successful practices and related information at **http://pnwsteep.wsu.edu**, click on"1998 conference section."
- **Austrian Winter Peas for Dryland Green**—A bulletin. Contact: Jim Krall, University of Wyoming, (307) 532-7194 or jkrall@uwyo.edu.
- **Long-term Management Effects on Soil Productivity and Crop Yield in Semi-Arid Regions of Eastern Oregon**—November 1989. Contact: Paul E. Rasmussen, USDA - Agricultural Research Services, Columbia Plateau Conservation Research Center, P.O. Box 370, Pendleton, OR, 97801. Phone: (503) 276-3811.
- **Dryland Farming In The Northwestern United States**—Contact: Washington State University, Cooperative Extension, Pullman, WA, 99164-6420.
- **Amber Waves, 1992**—Contact: Bulletins Office, #XB1025, Cooperative Extension, Washington State University, Pullman, WA, 99164-5912.
- **Cereal-Legume Cropping Systems: Nine Farm Case Studies in the Dryland Northern Plains, Canadian Prairies, and Intermountain Northwest**—Contact: Alternative Energy Resources Organization (AERO), 25 So. Ewing, Suite 214, Helena, MT, 59601. Phone: (406) 443-7272.
- **Sustainable Agriculture in the Northern Rockies and Plains**—Contact: AERO at above address.
- **Prospects For Sustainable Agriculture in the Palouse: Farmer Experience and Viewpoints, 1990**—Contact: Washington State University, Pullman, WA, 99164-6420.

Social Science & Sustainable Agriculture

- **Social Capital and Sustainability. The Community and Managing Change in Agriculture (VIDEO)**—Price: $20 (plus $5 shipping charge). Contact: North Central Regional Center for Rural Development, Iowa State University, 404 East Hall, Ames, IA, 50011. Phone: (515) 294-8321.

Research Design and Community Participation

- **Farmer/Scientist Focus Sessions: A How-To Guide**—By Daniel Green-McGrath, Larry S. Lev, Helene Murray and Ray D. William. Order up to six free-of-charge. Contact: Publications Orders, Agricultural Communications, Oregon State University, Administrative Services, A422, Corvallis, OR, 97331-2119, or phone (503) 737-2513.

Research and Education
Farmer/Rancher Summaries
Index: Project Reports

- **Whole Farm Case Studies: A How-To Guide**—By Helene Murray, Daniel Green-McGrath, Larry S. Lev and Alice Mills Morrow of Oregon State University. Order up to six free-of-charge. Contact: Publications Orders, Oregon State University at same address as above.
- **Participatory On-Farm Research and Community Involvement in Agriculture and Environmental Issues: An Annotated Bibliography**—January 1980 - May 1992
- **Facilitator's Guide to Involving the Public in Applied Agricultural Research: Planning and Coalition Building** —August 1992
- **Land Grant University Agriculture and Natural Resources Research: Perceptions and Influence of External Interest Groups**
- **Exploring the Unique Qualities of Sustainable Agriculture Research and Education** —Reference #MISC0178. FREE. Bulletins Office, Cooperative Extension, Cooper Publications Bldg., Washington State University, Pullman, WA, 99164-5912. Phone: (509) 335-2857.
- **Community Ventures: Partnerships in Education and Research**—A series of publications (costing $1.00 each) on participatory methods for working with and learning from diverse audiences. Contact: Bulletins Office (same address and phone number as above), Washington State University.

Permaculture

- **Permaculture-Sustainable Farming, Ranching, Living...by Designing Ecosystems that Imitate Nature**—Central Rocky Mt. Permaculture Institute. Contact: Jerome Osentowski, Central Rocky Mt. Permaculture Institute, P.O. Box 631, Basalt, Colorado, 81621, (970) 927-4158 or **http://sunsite.unc.edu/london/permaculture.html**

Solarization

- **Perspectives on Solarization (AUDIO TAPE SERIES)**

Key Web Sites and List-Serve

- **Western SARE: http://wsare.usu.edu/**
- **SAN & SARE: www.sare.org**
- **Sanet-mg:** An electronic-mail discussion group of about 800 scientists, educators, producers and administrators from across the nation, which is sponsored by SAN. Through interactive questions-and-answers or general discussion, participants can find specific information and learn about sustainable agriculture approaches in diverse settings. To subscribe to sanet-mg, send the message "subscribe sanet-mg" to majordomo@ces.ncsu.edu

Western SARE

Farmer/Rancher Summaries

Farmer/Rancher Research Grants

Western Region
Sustainable Agriculture Research and Education

The farmer/rancher research grant program makes producers and producer groups residing in the Western U.S. eligible to compete for grants to identify, evaluate and test sustainable agriculture practices and challenges. Individuals can apply for up to $5,000; producer groups (three or more farm/ranch operations working cooperatively) can apply for up to $10,000.

Begun in 1995, nearly 150 producer-directed research grants have been funded in the Western region since its inception. The effort gives farmers and ranchers direct access to research and education funds authorized by the U.S. Congress to further the adoption of sustainable agriculture.

Grant proposals are reviewed and evaluated by a diverse group of producers, researchers, educators and administrators who are familiar with sustainable agriculture. Final selections are made by an appointed panel, at least half of which are producers. All funding is awarded competitively.

Grant reviewers look for potential projects that clearly define local sustainable agriculture problems or issues and propose innovative solutions. On-farm tests of suggested technologies and approaches are strongly encouraged. All research proposals must be led by one or more producers, include a professional agricultural technical advisor (an extension agent or university researcher, for example) and provide a plan for sharing gained information with others in the community.

Following is a list of farmer/rancher research efforts, organized by state or territory. The 1998 and 1999 projects include brief descriptions. Grants funded earlier are also listed. For summaries of all projects, go to **www.sare.org**, click on "Funded Projects" and search using the project number listed in ( )s.

Calls for proposals for Farmer/Rancher Research Grants are distributed in the fall and are due for submission in January. To apply for a grant, or to get on the mailing list for a call for proposals, contact the Western SARE office at (435) 797-2257 or wsare@mendel.usu.edu. Past and current calls for proposals and other information is on-line via the Western SARE Web site at **http://wsare.usu.edu/**.

FARMER/RANCHER GRANTS

Alaska

Development of Late Blight Forecasting Model (FW99-021)
Producer: Bob Boyd
Location: Palmer, Alaska
Grant Award: $6,078
Summary: Late blight was found for the first time on several potato farms in Alaska in 1998. This project is intended to help develop a prediction model similar to those used in other potato growing areas by relating temperature and relative humidity at multiple sites to late blight events. This model will help predict the timing of late blight outbreaks and help reduce the required applications of protectant fungicides.

Propagation of Indigenous Lingonberry Species for Sustainable Development (FW98-064)
Producer: Vickie Talbot
Location: Trapper Creek, Alaska
Grant Award: $5,000
Summary: This project proposes to find and select lingonberries from wild stands adapted to the short growing season in Alaska. Plants with good fruit and rhizome production will be propagated through tissue culture to provide additional plants for the development of a full-fledged commercial operation.

Growing American and Korean Ginseng in Alaska (FW97-026)
Producer: David C. Smith
Location: Anchorage, Alaska; Grant Award: $5,000

Establish More Efficient and Biological Practice for Bringing Forest Land into Agricultural Use through Sustainable Development Using Indigenous Species in Alaska (FW96-0082)
Producer: Vickie Talbot
Location: Trapper Creek, Alaska; Grant Award: $3,000

Establish More Efficient and Biological Practices for Bringing Forest Land into Agricultural Use Through Sustainable Development Using Indigenous Species in Alaska (FW95-0111)
Producer: Vickie Talbot
Location: Trapper Creek, Alaska; Grant Award: $5,000

American Samoa

Effect of Pesticides vs. Traditional Treatments for Banana Scab Moth in American Samoa (FW99-037)
Producer: Roseline Liu
Location: Vaitogi, American Samoa
Grant Award: $1,600
Summary: The purpose of this study is to test the efficiency of several traditional methods of reducing scab moth damage in bananas. Seven randomly ordered treatments will be tested at two sites on Tutuila, the main island of American Samoa. Mature bunches from each treatment will be evaluated for scab moth damage.

Self-Sustaining Swine Production Operation (FW99-030)
Producer: Juan Chan
Location: Pago Pago, American Samoa
Grant Award: $4,500
Summary: Swine production lags behind demand ever since government-subsidied feed was curtailed five years ago. This operation is intended to convince farmers that production of swine can be coupled to production of their feed using locally adapted root crops with low incidence of pest and disease problems through a composting and biogas digester system.

Amalau Valley Fruit Tree and Native Tree Nursery (FW99-027)
Producer: Matautu Tagoilelagi
Location: Village of Vatia, Pago Pago, American Samoa
Grant Award: $2,463
Summary: Fresh fruit and vegetables are available almost exclusively on an import basis. Bud grafted, air layered fruit trees will be explored as a way to encourage local industry and provide fruit for the island. Farmers will be shown how to propagate their own trees as well as how to maintain and care for them. In addition, rare or endangered native trees will be propagated to work toward their continued survival.

Leone Greenhouse (FW99-025)
Producer: Mark Kneubuhl
Location: Pago Pago, American Samoa
Grant Award: $1,500
Summary: A screen house will be built to allow for year round tomato production. Unlike traditional screen houses built from expensive, permanent materials, this screen house will be constructed from PVC and grommeted draping screen cloth connected with hooked elastic cords. Crops will be protected in normal bad weather conditions, but the cloth can be easily dismantled in more extreme conditions. Plants will be fertilized with chicken manure from the producer's poultry farm. Three tomato crops are expected each year.

Tilapia Farm—Aoloau (FW99-023)
Producer: Ioelu Seve
Location: Aoloau Village, Pago Pago, American Samoa
Grant Award: $3,225
Summary: This project plans to stabilize and build fish ponds for tilapia production. Effluent from the ponds will be used to irrigate watercress fields nearby creating a source of fertilizer.

Canco Hill Screen House (FW99-001)
Producer: Naotala M. Tuli
Location: Pago Pago, American Samoa
Grant Award: $1,400
Summary: This project will construct a screen house to protect vegetables and flowers from slug and snail damage. Effluent from an on-site pig barn will be used as fertilizer for the crops.

Onenoa Eel and Tilapia Farm (FW98-055)
Producer: Alosina Toomalatai
Location: Pago Pago, American Samoa
Grant Award: $2,210
Summary: Fish have traditionally been a major part of the diet of the Samoan people. Historically, the reef around the island has provided a substantial portion of this aquatic portion of the diet. Rapid increase in the population of Samoa has overtaxed this resource. This project proposes to address this need by providing Tilapia

fish and fresh water eels to the Samoan, Korean, and Philipino communities. This is a pilot project built on an existing facility to create a fully commercial fish and eel production area with primary and secondary processing through fresh and smoked produce.

Samoa Department of Agriculture Community Nutritional Support Group (FW98-021)
Producer: Litani Ahoia
Location: Pago Pago, American Samoa
Grant Award: $4,646
Summary: This project plans to breed fresh water tilapia and sesele, a local fresh water fish, to produce fingerlings for distribution to a group of agricultural extension agents and community members for raising. The project will also conduct vegetable variety trials and produce bedding plants for distribution to the group and community members.

Piggery Deep Litter System (FW98-056)
Producer: Nikolao Mageo
Location: Pago Pago, American Samoa
Grant Award: $2,975
Summary: Flooding the streams with fresh pig manure is becoming a more critical issue in American Samoa. The EPA and Coastal Zone Management have created legal regulations banning the disposal of any piggery wastes in these protected areas. This project proposes to use the coral sand, which is an abundant resource in the islands, as a binding agent with pig manure in the pens to manage the waste problem in this piggery. Compost created in this manner will be used to fertilize taro, banana, and coconut crops.

Beef Cattle Pasture Management Project (FW98-057)
Producer: Ma'ataua Te'o
Location: Pago Pago, American Samoa
Grant Award: $2,900
Summary: This project will address the need to manage farm pastures to improve productivity, facilitate cattle management, and protect steep slopes and drainage systems from erosion. Through a system of border fencing with four strand barbed wire and interior fencing with solar-powered electric fences, and including a small corral/chute handling area, the project will restrict the cattle to the lower slopes and away from drainage courses. This will be used as a demonstration project for small scale beef cattle production on small island territories.

Continuation of a Sustainable Agroforestry System (FW97-039)
Producer: Malo Paleso'o
Location: Tutuila, American Samoa; Grant Award: $2,315

Pig Manure Control and Utilization Project (FW96-079)
Producer: Tovia Tuli
Location: Pago Pago, American Samoa; Grant Award: $5,000

Composting Farm and Kitchen Wastes in American Samoa (FW95-103)
Producer: Juan Chan
Location: Pago Pago, American Samoa; Grant Award: $721.41

Development of a Sustainable Agroforestry System (FW95-105)
Producer: Malo Paleso'o
Location: Tutuila, American Samoa; Grant Award: $2,765

Controlling the Banana Scab Moth Caterpillar in American Samoa Through Cultural Methods (FW95-106)
Producer: Fetalai Lefee
Location: Pago Pago, American Samoa; Grant Award: $1,400

Arizona

Carrying on Dine' Cultural/Traditional Flour Corn Farming: Roots of Dine' People (FW99-061)
Producers: Woodie and Maggie Jodie
Location: Pinon, Arizona
Grant Award: $5,000
Summary: Dine' traditional and cultural farming practices and techniques will be promoted through no-till/direct seed farming. Three sites will be used for demonstration farms showing traditional and modern techniques of corn production.

Navajo Nation Livestock Disease Survey (FW98-031)
Producer: Glenda Davis
Location: Window Rock, Arizona
Grant Award: $7,000
Summary: This project proposes to survey the livestock of the Navajo Nation for mineral deficiency and diseases that can adversely affect both

livestock and people. This survey will help develop better disease prevention and nutritional recommendations for the livestock producers of the Navajo Nation. Once areas of disease and mineral deficiency incidence are located, vaccinations and supplementation will begin on a wide scale.

Moving Succession Forward in a Lehmann Lovegrass Monoculture (FW96-010)
Producer: Steve Getzwiller
Location: Benson, Arizona; Grant Award: $3,000

Goal-Driven, Intensive Management of a Riparian/Sandy Bottom Site (FW96-012)
Producer: Kali Holtschlag
Location: Dragoon, Arizona; Grant Award: $4,310

Managing Biological Processes for Maximum Diversity and Productivity (FW96-045)
Producer: Mike Mercer
Location: Benson, Arizona; Grant Award: $2,500

California

Converting Dairy Waste into More Usable Products through Vermiculture (FW99-073)
Producers: Charmaine Harris and Carolyn Foxe
Location: Visalia, California
Grant Award: $4,300
Summary: This project plans to address the problem of increasing amounts of dairy waste, a decreasing market for dairy manure in its natural state, and the detrimental environmental impact of dairy waste on the air, water, and soil. Dairy manure will be converted into a more usable product, vermicompost, through the addition of composting worms and utilizing the wastewater from dairies.

Central Coast Vineyard Team Positive Points System Evaluation and Education Program (FW99-108)
Producer: Dana Merrill
Location: Paso Robles, California
Grant Award: $10,000
summary: The Positive Points System (PPS) has developed a protocol for evaluating vineyards on their sustainable and integrated farm management approach. The protocol addresses pest, soil, water, and viticulture management, wine quality and continuing education. This project will continue and expand the work of the PPS by evaluating cooperating growers, and encouraging and providing specific information about sustainable viticulture practices.

Solarization for Small Farm "Specialty Crops" (FW98-012)
Producers: Mike and Sandie Smith
Location: Fresno, California
Grant Award: $4,000
Summary: This project will evaluate soil solarization as an alternative to herbicides for weed management in cilantro and parsley production.

Soil Solarization as a Methyl Bromide Alternative in Strawberries (FW98-009)
Producer: Touxia Thaoxaochay
Location: Clovis, California
Grant Award: $4,000
Summary: Methyl bromide is a highly toxic fumigant that is scheduled to be banned in 2001 as an ozone depletor. This project will explore soil solarization as an alternative to methyl bromide on a strawberry farm in the Central Valley. Many of the strawberry producers in the valley are Hmong farmers who are in need of low cost, effective, and safe technologies to assist them. This project will compare weed control in fields that have been solarized with fields that have been fumigated and disseminate the results through a variety of outlets, including Hmong television and radio stations.

Goats as a Source of Weed and Brush Control in Forest Plantations (FW98-072)
Producer: Aaron Albaugh
Location: Adin, California
Grant Award: $5,000
Summary: Many pine plantations established after the Grieg Fire in 1978 on the Big Valley Ranger District of the Modoc National Forest have a thick understory of brush species, primarily green-leaf manzanita (*Arctostaphylos patula*) and snowbrush (*Symphoricarpus rotundifolia*). These species inhibit tree growth by their intake of moisture and nutrients and also contribute to a ladder of fuels that could allow wildfire to get into the crowns of planted trees. This project will use goats as a vegetative management tool to manipulate the brush to promote plantation growth and reduce the fuels ladder. The project hopes to prove that the use of goats can be an economical, environmentally friendly, and effective means of weed and brush control.

Pheromone Foggers for Pesticide Replacement (FW97-030)
Producer: Willis Thompson
Location: Grenada, California; Grant Award: $5,000

Vermicomposting Demonstration Project (FW97-016)
Producer: Dave Renner
Location: Ferndale, California; Grant Award: $5,000

Feasibility of Soil Solarization for Strawberry Production on the Central Coast of California (FW97-011)
Producer: Larry Galper and Ed Kelly
Location: Watsonville, California; Grant Award: $5,000

Individual Confinement Rearing versus Pasture-based Group Rearing of Dairy Calves (FW97-012)
Producer: Jim Wackerman
Location: Orland, California; Grant Award: $3,248

Farming, Agriculture and Resource Management for Sustainability (F.A.R.M.S.) (FW96-053)
Producer: Craig McNamara
Location: Winters, California; Grant Award: $5,000

Monitoring Program for Biologically Integrated Orchard Systems (BIOS) in Walnuts (FW95-089)
Producer: Liza Lewis
Walnut BIOS Management Team
Location: Davis, California; Grant Award: $5,000

Colorado

Hydraulic Windmill Pump (FW99-011)
Producer: Lonnie Jackson
Location: Kim, Colorado
Grant Award: $2,733
Summary: The purpose of this project is to explore and develop the feasibility of a windmill-powered hydraulic pump to water cattle. This type of pump system may reduce the cost of well replacement by at least fifty percent. The project will also reduce the amount of time involved in repairing windmills and improve the utilization of the range.

Sustainable Sheep Dairy Project (FW99-065)
Producers: Steve and Carolyn Keller
Location: Monte Vista, Colorado
Grant Award: $3,550
Summary: The viability of a seasonal grass-based sheep dairy in a high elevation environment will be explored through the development of dairy and milking facilities. For those with an adequate feed base, adding a third income from their current flock, in addition to sheep and wool production, could prove to be an economically viable alternative.

Cumbres and La Manga Cattlemen's Association Range Analysis and Improvement Project (FW98-065)
Producer: Dennis Moeller
Location: Antonito, Colorado
Grant Award: $8,700
Summary: This project will identify the impacts on vegetation and soil of various types of users of rangeland. Permitees will be trained in range monitoring and range management techniques including weed and plant identification, riparian and upland rangeland management, and other monitoring techniques. The purpose of the training is to learn how to manage the range to minimize negative grazing impacts and improve the range quality.

Annual Forage Production for an Intensive Winter Grazing System (FW98-025)
Producer: John Haws
Location: Monte Vista, Colorado
Grant Award: $2,665
Summary: In order to address the winter feed needs of mothering cows and reduce off farm inputs, several forage crop combinations will be tested for their potential to provide winter livestock feed, including field corn, sweet corn, oats, and pearl millet. Cow manure and fixed-nitrogen from peas will be incorporated into the fields to reduce the nitrogen requirements for wheat the following year.

Integrated Weed Management of Musk Thistle with Emphasis on Biological Control (FW98-024)
Producer: Larry Matschke
Location: Jaroso, Colorado
Grant Award: $2,938
Summary: This project aims to minimize the impact of musk thistle through biological control from two weevil species, musk thistle seed weevil (*Rhinocyllus conicus*) and rosette weevil (*Trichosirocalus horridus*). Control of musk thistle has the potential to enhance the value of alfalfa hay sold by the farmers in the area. Project results will be shared with local ranchers and landowners to show the benefits of integrated weed management techniques.

Testing Alternative Crop Rotations to Traditional Small Grain/Fallow System (FW98-020)
Producer: James Faughnan
Location: Elbert, Colorado
Grant Award: $3,000
Summary: An alternative to the traditional small grain-fallow rotation will be explored with a fallow-wheat-oats rotation to increase the frequency of crops from specific fields. This alternative would enable farmers to develop a greater degree of economic sustainability in the face of the phase out of government programs and decrease erosion of fields by reducing the amount of time the fields are fallow.

Pasture Fryer Chickens (FW97-045)
Producer: Pete Mattics
Location: Olathe, Colorado; Grant Award: $2,500

Establishing Perennial Grass in Existing Alfalfa (FW97-032)
Producer: Douglas B. Wiley
Location: Boone, Colorado; Grant Award: $1,825

Converting Pasture Land to Specialty Crop Production as an Alternative Farm Enterprise (FW97-003)
Producer: Trent J. Taylor
Location: Hesperus, Colorado; Grant Award: $2,500

Habitat Management as a Transitional Tool to an Insecticide-free Pest Management Program in Apples (FW96-005)
Producer: Bob White
Location: Hotchkiss, Colorado; Grant Award: $1,500

Evaluation of Alternative Crops in Dryland Multi-Crop Rotations on Farms in the Northeastern Colorado Region (FW95-047)
Producer: Joe Kinnie
Location: Julesburg, Colorado; Grant Award: $5,000

Guam

Genetic Upgrading and Improving Goat Management Practices on Guam (FW99-031)
Producer: Loella Armstrong
Location: Agana, Guam
Grant Award: $6,000
Summary: Three major problems associated with goat production on Guam are the need for genetic upgrading of broodstocks, lack of developed pasture grasses, and high incidence of internal parasites. These issues will be addressed through artificial insemination to decrease stock inbreeding, new plantings of Desmodium sp. or Flaminga sp. grasses to improve pasture sites, and systematic checks and treatment of parasites.

Mushroom Production (FW99-015)
Producer: David Nelson
Location: Barrigada, Guam
Grant Award: $3,950
Summary: The aim of this project is to demonstrate how backyard and commercial farmers can produce fresh mushrooms, a premium priced imported item. A commercial operation for spawn and mushroom production will be established. Mushroom kits, inoculated bags of substrate, will then be sold to home growers to develop their own mushroom production.

Use of Sunnhemp as a Cover Crop in Cucumber Production (FW97-054)
Producer: Felix Quan
Location: Tamuning, Guam; Grant Award: $4,300

Dry-Extrusion of Wet Garbage for Swine Feeding (FW96-029)
Producer: George Pangelinan
Location: Yigo, Guam; Grant Award: $4,350

Vegetable Soybean Cultivator Trials (FW96-030)
Producer: Felix Quan
Location: Tamuning, Guam; Grant Award: $3,020

Hawaii

Lone Palm Sprouts Water Recapture and Recycle System (FW99-066)
Producer: David Rotstein
Location: Kapaau, Hawaii
Grant Award: $5,000
Summary: The production of edible sprouts results in approximately 335,000 gallons of water per month that is unrecoverable. A water capture system will be built and implemented to enable a sprout farm to recycle and re-use the majority of the water that presently enters the floor drain. The system will bring the water to a level of quality consistent with the Hawaii State Department of Health, Safe Drinking Water Branch standards.

Flower Induction of Rambutan (FW99-059)
Producer: Liloa Willard

Location: Papaikou, Hawaii
Grant Award: $2,100
Summary: This project proposes to test several methods to induce flowering of rambutan, a tropical fruit native to Malaysia, to increase consistency and predictability of the crop. Average annual rainfall of 130 inches per year inhibits the trees from setting fruit on a consistent basis. The methods that will be employed include covering the tree surface roots with plastic tarps to dry out the roots, root pruning no more than one-third of the distance between the drip line and the trunk on two sides of the tree, and chemically inducing flower production with foliar spray.

Hot Water Immersion Unit for Disinfestation of Hawaii-Grown Lychee and Longan (FW99-056)
Producer: Michael Strong
Location: Kilauea, Hawaii
Grant Award: $5,000
Summary: A hot water immersion system will be built for quarantine treatment of lychee and longan. This technique will be used as an alternative to the current, and more expensive, practice of irradiation for treating infestation of Mediterranean fruit fly, oriental fruit fly and litchi fruit moth. A hot water dip of 49 degrees Celsius for 20 minutes is an accepted treatment for these pests that will allow the fruit to be marketed on the U.S. mainland.

High Quality Perennial Forage Peanut (*Arachis pintoi*) Pastures for Sustainable Cattle Production in Hawaii (FW98-075)
Producer: Zach Gibson
Location: Honokaa, Hawaii
Grant Award: $5,000
Summary: The goal of this project is to develop more profitable, environmentally safe, and sustainable legume-based cattle production systems for Hawaii. Efforts will be focused on utilization of pasture based on a subtropical legume, perennial forage peanut, greater on-farm production of feed, and reduced production costs.

Free Range Pork Production (FW98-062)
Producer: Samuel I. Okami
Location: Anahola, Kauai, Hawaii
Grant Award: $5,390
Summary: The purpose of this project is to explore the viability of a free range hog farm on land formerly used for sugarcane production. With education and adequate technical support, hog grazing could provide a sustainable approach to diversified agriculture in the area.

The Conversion of Agricultural Waste into Plant and Fish Food (FW98-004)
Producer: Robert Gann
Location: Pukalani, Hawaii
Grant Award: $3,400
Summary: This project proposes to convert fish and plant waste into economical, high quality fish and plant food through a bioconversion system in fish ponds. Plant waste, soy pulp from a local tofu factory, and fish parts from a processing plant will be processed into fish food. The water circulating through the system will be used to feed beds of watercress, green onions, basil and tomatoes.

Total Utilization of Swine Waste for Crop and Hog Productivity (FW98-063)
Producer: Ronald B. McKeehan
Location: Honokaa, Hawaii
Grant Award: $4,965
Summary: Hog farming in Hawaii is becoming less profitable for producers due to the rise in shipping costs of grain and competitive meat prices that the mainland can offer. Using hogs' natural abilities to root and deposit waste combined may be a practical, environmentally safe and inexpensive way to sustain hogs. Various forage crops, used as supplemental hog feed, will be tested for growth in the tropical climate of Ahualoa, Hawaii on a rotational system. Other producers may see that vacant land once used by the dying industry of sugar plantations may be used alternatively for hog operations.

Growing Ring-Spot Virus-free Papayas Using Anti-Transpirants and Other Sustainable Techniques (FW97-017)
Producer: Jon Biloon
Location: Captain Cook, Hawaii; Grant Award: $4,000

Sustainable Alternatives to Herbicide for Weed Control: Using Cover Crops to Combat *Panicum repens* and *Panicum maximum* in Lowland, Eastern Hawaii (FW97-004)
Producer: Paul D. Acciavatti
Location: Hakalau, Hawaii; Grant Award: $3,500

Sustainable Greenhouse Tomato Production: Evaluating Alternatives to Pesticides for Controlling Tomato Pinworm Larvae in Hawaii (FW96-049)
Producer: Shari Tresky
Location: Hakalau, Hawaii; Grant Award: $3,520

Idaho

Automated On-Farm Irrigation Water Diversion Gate (FW99-012)
Producer: George W. Davis
Location: Caldwell, Idaho
Grant Award: $3,890
Summary: This project will enable farmers and ranchers to receive the correct amount of water for irrigation needs regardless of water levels in their supply source by using an automated gate that will open and close to adjust for water levels. The gate will also be beneficial to water managers in regulating flows by having accurate water delivery measurements at each point of diversion.

On-Site Rearing of Beneficial Predatory Mite Species (FW99-076)
Producer: Richard Nathanson
Location: Bonners Ferry, Idaho
Grant Award: $4,200
Summary: An on-site beneficial mite rearing system will be developed to rear and utilize predatory mites for control of the two spotted mite in greenhouses. This technique will integrate caging, environmental controls and beneficial insect/mite feeding systems, and will allow the producer to control a pest organism with a local, on-site, and sustainable alternative to biological controls.

Wiersema Dairy Agroforestry Project (FW98-099)
Producers: Jim and Patty Wiersema
Location: Buhl, Idaho
Grant Award: $5,000
Summary: This project will implement an agroforestry demonstration area designed to find an alternative use for dairy cattle waste. Hybrid poplar trees will be planted as a field windbreak and woodlot. Trees will be irrigated with liquid waste from the dairy farm combined with irrigation water.

Fear and Loathing in the Potato Patch: Controlling Nematodes with Rape Seed Meal and Green Manures (FW98-097)
Producer: John O'Connor
Location: Buhl, Idaho
Grant Award: $9,910
Summary: Nematodes are a tremendous problem for both conventional and organic potato growers in southern Idaho. Green manure and rape seed meal will be explored as an alternative to fumigants for nematode control on one conventional and two organic farms.

Non-irrigated Alfalfa Performance Trial (FW97-049)
Producer: Christina Crawford
Location: Benewah County, Idaho; Grant Award: $3,500

Paradise Time-Controlled Grazing (FW97-044)
Producers: Mark and Wendy Pratt
Location: Blackfoot, Idaho; Grant Award: $5,000

Systems Thinking in a Range Environment (FW97-024)
Producers: Jay Black and Joel Hermann
Location: Hammet, Idaho; Grant Award: $5,000

Economic Viability of Greenhouse Solarization (FW96-060)
Producer: Larry Higgins
Location: Sandpoint, Idaho; Grant Award: $2,450

Biological Control in Idaho Alfalfa Seed Fields (FW95-025)
Producer: Larry Sorenson
Location: Parma, Idaho; Grant Award: $5,000

Squash Bug Management through Introduction of Game Birds (FW95-080)
Producer: Jill Kohler
Location: Eagle, Idaho; Grant Award: $2,740

Row Spacing Effect on Weed Suppression (FW95-034)
Producer: Lee Griffiths
Location: Blackfoot, Idaho; Grant Award: $530

Developing an Idaho-Based Marketing Cooperative for Sustainably and Locally Grown Produce (FW95-046)
Producer: Janie Burns
Location: Nampa, Idaho; Grant Award: $4,622

Micronesia

Rehabilitation of Degraded Savannah Land (FW99-079)
Producer: Kesewaol Bishop
Location: Koror, Palau
Grant Award: $3,500

Summary: Savannah land in Palau will be rehabilitated through the development and implementation of a demonstration project focusing on soil conserving and enhancing techniques. Water diversion, run off catchment and gulley restructuring will be addressed. Fire prevention and mitigation measures will be installed. Alley cropping and cover crops will address soil enhancement needs. Pioneer trees and nursery trees will also be planted to later support fruit/nut and lumber trees.

Montana

No-Till Wheat into Medic vs. Conventional Wheat (FW99-069)
Producer: Jess Alger
Location: Stanford, Montana
Grant Award: $4,578
Summary: This project will compare a conventionally farmed 49 acre field using sprays and fertilizers with a sustainable 42 acre field using no-till and no chemicals or fertilizers. The difference these methods have on production costs, net dollar income per acre, and soil tilth will be measured. Legumes will be intercropped to diminish weed competition and add nitrogen to the soil.

Range Monitoring in the Badlands Grazing District (FW99-102)
Producer: Jack McCuin
Location: Glasgow, Montana
Grant Award: $10,000
Summary: The Badlands Cooperative State Grazing District is implementing a rangeland monitoring program to determine how ongoing management practices affect rangeland. Successful monitoring will allow the group to enhance environmental quality and sustain the economic viability of their respective ranching operations. At least half of the District will be monitored in 1999.

Annual Forages for Dryland Rotations (FW98-035)
Producer: Vern Pluhar
Location: Cohagen, Montana
Grant Award: $1,540
Summary: In eastern Montana, forage production is limited by the low availability of irrigation water coupled with low rain fall. The major cropping system is rotational small grain crop fallow. Incorporating an annual forage into the existing cropping system will improve the livestock industry and provide an opportunity to increase or sustain soil quality. Field trials will be conducted on different annual forage crop types to determine production feasibility in the current cropping system.

Cull Potato Composting (FW98-093)
Producer: Steve McCullough
Location: Townsend, Montana
Grant Award: $7,500
Summary: The goal of this project is to turn cull potatoes into a beneficial byproduct instead of a disposal problem. Cull potatoes will be composted with sawdust from local sawmills to achieve the optimum carbon:nitrogen ratio. The resultant compost will be utilized by farmers or marketed locally. Reduction in county "tipping fees" for dumping garbage at an area landfill is projected at ten percent.

Green Manure / Cover Crop Combination Experiment (FW96-007)
Producer: Rod Daniel
Location: Grantsdale, Montana; Grant Award: $1,923.15

Evaluation of Grass Species for Improved Pasture Management (FW96-073)
Producer: Robert Lee
Location: Judith Gap, Montana; Grant Award: $4,800

Legume Grazing in Rotation with Small Grains (FW96-008)
Producer: Jess Alger
Location: Denton, Montana; Grant Award: $4,000

Vegetative Changes through Alternative Water Sources (FW96-083)
Producer: Dale Veseth
Location: Malta, Montana; Grant Award: $2,500

Carter-Fallon Forage Committee Range/Livestock Project (FW95-026)
Producer: Randy Tunby
Location: Baker, Montana; Grant Award: $4,943

Managing a Living Mulch System in an Intensive Organic Vegetable Cropping Operation to Enhance Weed, Nutrient and Pest Management (FW95-078)
Producer: Helen Atthowe
Location: Stevensville, Montana; Grant Award: $5,000

Influencing Elk and Livestock Riparian Use (FW95-093)
Producer: Allen Carter
Location: Livingston, Montana; Grant Award: $4,750

Nevada

Alfalfa: Can It Be A Viable Grazing Forage? (FW99-095)
Producer: Tom Filbin
Location: Golconda, Nevada
Grant Award: $3,000
Summary: While most livestock producers in Nevada are dependent on public land for a majority of their forage, there is growing interest to increase grazing capacity on private land. Grazing alfalfa has potential to increase grazing capacity on private ground for livestock producers by fixing atmospheric nitrogen, eliminating the need to add expensive nitrogen fertilizers, and building soil structure with its deep roots. This project will develop a grazing system that includes alfalfa as a dominant percentage of the total forage and minimize the effects of bloat, a common problem for producers growing alfalfa.

New Mexico

Verification of Bat Predation of Pests on a 60,000 Acre Irrigated Farm (FW99-044)
Producer: James Dangler
Location: Farmington, New Mexico
Grant Award: $4,000
Summary: Local bat species will be identified and their habitats enhanced to encourage integrated pest management of insects. Analyses of bat echolocation calls will be used to verify presence of species and frequency of their feeding activities. Indices of predator feeding activities and pest counts from trapping data will be correlated to reduction in crop damages.

Passive Solar Greenhouse Construction and Growing Trial (FW99-008)
Producer: Cathy Hope
Location: Questa, New Mexico
Grant Award: $5,000
Summary: Small family farmers who live at higher altitudes with heavy wind and/or long winters currently have few good solutions to growing vegetables or culinary herbs from late October through early May. This project will construct a passive solar greenhouse system that uses locally available materials, enables year round growing of vegetables with no external heat source or electricity except a solar fan, and uses all the rainwater that falls on its roof.

A Temporary Step to a Permanent Solution: Use of Strawbales to Construct a Wind Barrier and System of Terrace Planting Beds (FW99-078)
Producer: Fatou Gueye
Location: Regina, New Mexico
Grant Award: $1,760
Summary: A wind barrier system of strawbales stacked six to eight bales high will be constructed to provide shelter while trees are becoming e stablished to form a permanent windbreak. In addition, a series of five foot wide terraces with a single bale height will be completed as the retaining front wall. These terraces will be filled with a mixture of manure, rotted sawdust, and compost and will provide new planting beds on uncultivable land.

Using a Cultivable Catchment System to Establish a Dryland Commercial Truck Farm (FW98-019)
Producer: John D. Leaf
Location: La Jara, New Mexico
Grant Award: $2,700
Summary: This project will establish productive vegetable beds on a relatively barren and agriculturally useless site using cross-linked polyacrylamides (CLP) and a permeable woven polypropylene mulch to make the beds themselves a catchment system for snowmelt and the scant amount of rain the site receives. The project aims to demonstrate the efficacy of this technology for providing solutions to the problems of water conservation, erosion control, and finding a cost effective way to put idle land into production.

Permanent Irrigated Pasture Demonstration Project Reducing Irrigation Water Use (FW98-030)
Producer: Milford Denetclaw
Location: Shiprock, New Mexico
Grant Award: $3,100
Summary: The irrigation system in Shiprock is unable to meet the seasonal demands for water under the current cropping mix employed by area producers. This project will establish a 12.5 acre demonstration area using cool season grasses (smooth brome and orchard grass) and clover in the place of alfalfa. Cool season grasses take advantage of winter/spring moisture and late summer/fall monsoon rains reducing the need for irrigation. One third of the acreage will be planted in an annual hay crop. Livestock will be grazed on the pasture in the early spring and then moved out to summer range, allowing the pasture to recover and provide a supply of hay in late June.

The Sustainable Use of Cover Crops in an Annual Vegetable Production System in Northern New Mexico (FW98-032)
Producer: Don Bustos
Location: Fairview, New Mexico
Grant Award: $4,289

Summary: Three farmers with diversified annual vegetable growing systems will develop an in-row cover crop living mulch system designed to sustain production levels and avoid using outside inputs. The implications of such a system will ideally address the issue of managing an annual vegetable production system that will sustain limited resource, small farms in Northern New Mexico.

Limiting Gopher Damage by Controlled Livestock Grazing (FW97-057)
Producers: Matt Schneberger and Nicolas Ortega
Location: Winston, New Mexico; Grant Award: $3,500

Value-added Wheat Production (FW97-042)
Producer: Tom Seibel
Location: Anton Chico, New Mexico; Grant Award: $3,500

Increasing the Value of Irrigated Pastures (FW96-001)
Producer: Darrell Baker
Location: Tucumcari, New Mexico; Grant Award: $4,200

Test Plot Demonstration for Organically Produced Small Grains, Phase II (FW96-046)
Producer: Lonnie Roybal
Location: Costilla, New Mexico; Grant Award: $5,000

Test Plot Demonstration for Organically Produced Small Grains, Phase I (FW95-003)
Producer: Lonnie Roybal
Location: Costilla, New Mexico; Grant Award: $5,000

Municipal Sludge and Legumes as Soil Builders (FW95-007)
Producer: Pete Tatschl
Location: Tucumcari, New Mexico; Grant Award: $4,290

Gila Permitees Association Elk Study (FW95-017)
Producer: Matt Schneberger
Location: Winston, New Mexico; Grant Award: $5,000

Northern Mariana Islands

Local Feed Production for Tilapia (FW98-003)
Producer: Nicolas A. Songsong
Location: Rota, Northern Mariana Islands
Grant Award: $4,500
Summary: Feed costs for raising tilapia fish constitute about 54 percent of a fish farmer's annual variable costs. In this project, on-farm plant waste will be incorporated into a "green diet" for juvenile tilapia fish to explore the potential of a farm-generated diet as an alternative to expensive imported commercial feed. Fish growth and palatability of forage will be compared on "green diet" and commercial fed fish.

Oregon

Integrated Strip-Till Systems for Vegetable Production in Western Oregon (FW99-005)
Producer: Rob Heater
Location: Corvallis, Oregon
Grant Award: $7,786
Summary: This project will identify appropriate strip-tillage machinery for western Oregon vegetable production with the goal of developing a system that increases soil quality, protects water resources, and increases economic viability. Sustainable practices will be utilized focusing on weed and insect management and nitrogen producing legume cover crops.

Improving the Sustainability of Pasture and Livestock Management through the Development of a Grazing Network in Lane County, Oregon (FW99-071)
Producer: Paul Atkinson
Location: Eugene, Oregon
Grant Award: $3,101
Summary: A grazing network is being developed in Lane County with the following objectives: a) educating livestock owners about grazing management practices and structural improvements that prevent stream contamination; b) exploring methods for improving pasture and extending the grazing season in ways that are economical and efficient for the producer; c) exploring different grazing models, fencing systems, and off-stream watering methods; and d) learning about efficient and economical multi-species grazing.

Clover Creek Ranch Early Weaning Comparison (FW98-074)
Producer: Ron Jones
Location: Ontario, Oregon
Grant Award: $2,658
Summary: Livestock producers within the Bully Creek watershed have come together and formed the Bully Creek Watershed coalition to address the problems of lower than desirable calf weaning weights, low rate of gain for the calves, and low quality of hay from grass hay fields. The project

will demonstrate a strategy of fertilizing the hay fields and cutting the hay earlier to improve hay quality, weaning the calves early and using the hay fields as irrigated pasture for the calves to increase weaning weights prior to selling.

Constructed Wetland for Waste Water Treatment (FW97-035)
Producer: Gary Shull
Location: Coquille, Oregon; Grant Award: $3,200

Using Goats to Control Juniper, Sage and Rabbit Brush (FW97-020)
Producer: Ann R. Snyder
Location: Powell Butte, Oregon; Grant Award: $3,500

Using Truffles to Enhance Douglas Fir Production on a Small Family Farm (FW97-007)
Producer: Tim Grant
Location: Eddyville, Oregon; Grant Award: $2,800

Reducing Foxtail in Permanent Pastures (FW97-002)
Producer: Kathleen Panner
Location: Riddle, Oregon; Grant Award: $3,500

Biological Control of Pear Pests (FW97-041)
Producer: George Ing
Location: Hood River, Oregon; Grant Award: $5,000

School Cafeteria Compost System for Soil Amendment Production (FW96-059)
Producer: Devon Strong
Location: Ashland, Oregon; Grant Award: $3,000

Grazing Sheep in New Forest Plantings (FW96-037)
Producer: Tom Lehman
Location: Corbett, Oregon; Grant Award: $1,575

Organic Mulch for Weed Control in Rhubarb (FW96-068)
Producer: Jeff Boden
Location: Hillsboro, Oregon; Grant Award: $2,500

The Effect of Aerated Compost Teas on Disease Control in Blueberries and Tomatoes (FW96-026)
Producer: Jack Gray
Location: Noti, Oregon; Grant Award: $2,610

Use of an Aerated Compost Tea as a Preventive Foliar Fungicide on Grape Vines (FW96-019)
Producer: Dave Michul
Location: Eugene, Oregon; Grant Award: $2,930

Use of Aerated Compost Teas for Control of Foliar Diseases of Spinach, Lettuce and Broccoli and to Promote Plant Vigor and Quality (FW96-0013)
Producer: William Booth / Debra Martin
Location: Blachly, Oregon; Grant Award: $2,620

Low Tillage Weed Control (FW96-0003)
Producer: Jim Fullmer
Location: Philomath, Oregon; Grant Award: $1,895

Evaluating Methods to Enhance Microbial Degradation of Residual Soil Contaminants (FW95-0075)
Producer: J.J. Haapala
Location: Junction City, Oregon; Grant Award: $5,000

Parasite and Nutrient Management of Composted Manure (FW95-0027)
Producer: Glenna Wilder
Location: Cornelius, Oregon; Grant Award: $1,225

Low Tillage Weed Control System (FW95-0050)
Producer: Jim Fullmer
Location: Philomath, Oregon; Grant Award: $1,600

Demonstration and Implementation of Integrated Fruit Production on Anjou Pears (FW95-0072)
Producer: Thom Nelson
Location: Odell, Oregon; Grant Award: $5,000

Utah

Hovenweep Burn Reseeding and Demonstration Area (FW99-117)
Producer: Mary Tso
Location: Montezuma Creek, Utah
Grant Award: $4,000
Summary: This project will address natural resource management techniques for American Indian livestock producers in the Four Corners area. Using an area burned by a wildfire, a land recovery demonstration program will be implemented focusing on replanting native and introduced grasses, forbs and shrubs beneficial for livestock and wildlife grazing.

Composting Poultry Waste Inside High Rise Layer Houses (FW99-080)
Producer: Mike Shepherd
Location: Spanish Fork, Utah
Grant Award: $4,992

Summary: A series of indoor composting trials will be conducted to explore the practice of indoor high rise layer house composting of poultry waste. Results will be disseminated through a guide that will help producers evaluate and adopt this practice.

Alternative Cropping for the Navajo Reservation (FW97-065)
Producer: Mark Maryboy
Location: Montezuma, Creek, Utah; Grant Award: $4,300

Increased Forage Production during Alfalfa Crop Rotation Years in Johnson Canyon, Utah (FW97-038)
Producer: Michael E. Noel
Location: Kanab, Utah; Grant Award: $2,900

Pasture Aeration and Fertilizer Study (FW95-084)
Producer: Ken Carter
Location: Mt. Home, Utah; Grant Award: $2,480

Washington

Options for Asparagus Cover Crops (FW99-013)
Producer: Mike Miller
Location: Sunnyside, Washington
Grant Award: $3,817
Summary: The goal of this research is to identify suitable cover crops for asparagus production that can be planted in the normal sequence of cultural practices, provide wind erosion control, and control and demonstrate the non-necessity of annual high rate manure applications.

Managing Grasshoppers in Tree Fruit Using Pastured Poultry (FW99-036)
Producer: Terry Swagerty
Location: Evans, Washington
Grant Award: $1,732
Summary: Pest and understory management in tree fruits will be addressed by using chickens in orchards to control grasshoppers and manage vegetation around the base of trees. Chickens will be fed around the bases of trees, effectively "hoeing" the vegetation.

Compost Thermal Subsidies in Commercial Passive Solar Greenhouse Design (FW99-063)
Producer: Rebecca Thistlewaite
Location: Underwood, Washington
Grant Award: $1,750
Summary: A large berm of hot compost will be established in the north side of a greenhouse to provide enough heat to grow standard cool season crops such as salad greens and brassicas. Soil and air temperatures, CO2 levels, and plant production and mortality rates in the compost-heated greenhouse will be measured over the length of the cold season.

Harvesting Alternatives for Burdock as an Alternative Crop in an Organic Production System (FW99-089)
Producer: Del Wisdom
Location: Basin City, Washington
Grant Award: $3,000
Summary: Soil preparation and harvesting techniques will be explored for burdock production. Two pieces of equipment for soil preparation and one for harvest will be tested and modified for efficiency.

Baby Corn Alternative Crop for Southwest Washington (FW98-002)
Producer: Own Shaffner
Location: Montesano, Washington
Grant Award: $3,460
Summary: This project will investigate the potential of baby corn as an alternative crop for southwest Washington. Eight varieties of sweet corn and field corn will be tested and measured for tasseling and silking dates, plant and ear heights, harvest dates, yield and ear quality. Marketing potential for these crops will be explored through restaurants, on-farm stands, and farmers' markets. In addition, the Western Spotted Cucumber Beetle will be monitored in the test plot to determine if the pest causes significant damage to the baby corn crop.

Brewster Area-Wide Management (B.A.M.)—Low Impact Control of Codling Moth and Leafroller in Apples (FW98-036)
Producer: Jim Divis
Location: Brewster, Washington
Grant Award: $10,000
Summary: Oblique banded leafroller (OBLR) has been a significant pest in the Brewster area for the past six years. The use of a "dual pheromone" dispenser for mating disruption of OBLR and codling moth (CM) will be explored. More than 1,400 CM/OBLR traps will be monitored in an effort to control these pests in a cost effective manner with the goal of less that one percent fruit damage at harvest.

Low Cost Vacuum Silage in the Pacific Northwest (FW98-067)
Producer: Tim Clark
Location: Lopez Island, Washington
Grant Award: $3,460

Summary: Vacuum silage will be explored as an alternative to traditional hay making. Feed quality and yield will be compared to dry hay. If successful, this method could provide a low cost, low risk, and nutritious way of producing winter feed while decreasing reliance on imported hay.

Organic Soil Amendments and Fertilization Practices for Processed Vegetable Crops: A Study in Nitrogen Mineralization and Soil Quality (FW98-076)
Producer: Woody Deryckx
Location: Ford, Washington
Grant Award: $8,025
Summary: This project will apply organic soil amendments and fertilizers at different rates to several irrigated potato and sweet corn fields in the course of commercial organic production. Soil nitrogen levels, plant tissue nitrogen levels, and the indices of soil quality will be monitored and related to crop yield and quality in order to develop a better understanding of economical and environmentally sound organic soil fertility programs for potatoes and sweet corn. Crop production budgets will be compiled to demonstrate relative economic efficiency.

Alternative Techniques to Control Apple Resistant Disease (FW98-082)
Producer: Fred Barkley
Location: Manson, Washington
Grant Award: $3,200
Summary: This project will explore cultural approaches to controlling replant disease in apple orchards, including a fallow period, green manure crops, microbial inoculants, and soil amendments. Replicated field plots will be used to produce statistically valid data.

Dryland Corn Production in Columbia and Walla Walla Counties (FW97-046)
Producer: David Carlton
Location: Dayton, Washington; Grant Award: $3,000

Release of the Predator Mite, *Amblyseius fallacis*, to Control Spider Mites in Red Raspberries (FW97-033)
Producer: Brian Cieslar
Location: Lynden, Washington; Grant Award: $1,850

Bamboo: Alternative Crop for Southwestern Washington (FW97-010)
Producer: R. D. Northcraft
Location: Tenino, Washington; Grant Award: $2,000

Vegetation Management on Small Acreages Using Short Duration, Intensive, Rotational Grazing (FW97-019)
Producer: Terry and Gayle Swagerty
Location: Evans, Washington; Grant Award: $2,043

Reducing Labor for Small Farm Harvesting (FW97-051)
Producer: Theresé Critchley
Location: Shaw Island, Washington; Grant Award: $2,500

Carrot Rust Fly Control (FW96-042)
Producer: Betsie DeWreede
Location: Rochester, Washington; Grant Award: $1,150

Alternative Crop Production in a Direct Seed Annual Crop Intense Rotation Program (FW96-041)
Producer: Karl Kupers
Location: Harrington, Washington; Grant Award: $4,400

Weed Control in Organic Apple Orchard (FW96-016)
Producer: Gary Holwegner
Location: Sunnyside, Washington; Grant Award: $2,550

Organic versus Synthetic Fertilizer - Container Nursery Trials (FW96-067)
Producer: Nils Sundquist
Location: Poulsbo, Washington; Grant Award: $4,575

Improved Nitrogen Utilization and Herbicide Reduction through Relay Intercropping (FW96-014)
Producer: Gene Tinklenberg
Location: Lynden, Washington; Grant Award: $4,230

Achieving Sustainability in San Juan County Hay Fields (FW96-055)
Producer: Julie Matthews
Location: Lopez Island, Washington; Grant Award: $2,750

Relay / Cover Crop for Corn (FW95-100)
Producer: Jerry Van der Veen
Location: Mt. Vernon, Washington; Grant Award: $5,000

Managing Riparian Areas with Remote Livestock Watering Facilities (FW95-008)
Producer: Craig Boesel
Location: Winthrop, Washington; Grant Award: $5,000

Intensive Grazing in Asian Pear Orchards (FW95-057)
Producer: R. Bruce Gregory
Location: Friday Harbor, Washington; Grant Award: $898.50

Wyoming

Improving Ranch Unit Stability and Sustainability through Grazing Irrigated Alfalfa (FW99-060)
Producer: Rick March
Location: Burns, Wyoming
Grant Award: $3,500
Summary: This project will compare the profitability and yield of grazing alfalfa with haying. Stocker cattle will be used to harvest irrigated hayland. Bloat loss will be diminished by putting dish detergent in the drinking water, in addition to other bloat protection practices.

Tall Stature Grasses for Winter Grazing and Spring Calving (FW96-023)
Producer: Matt Weber
Location: Baggs, Wyoming; Grant Award: $2,800

FLITNER Wetland Habitat Enhancement Project (FW95-076)
Producer: Stan & Mary Flitner
Location: Greybull, Wyoming; Grant Award: $5,000

Integrated Management to Improve Rangeland Health and Reduce Noxious Weeds (FW95-045)
Producer: Ogden Driskill
Location: Devils Tower, Wyoming; Grant Award: $5,000

Initiation of Integrated Management (FW95-067)
Producer: Tom Bruce
Location: Newcastle, Wyoming; Grant Award: $5,000

Western SARE

Index: Project Reports

Index of Project Reports

By Topic

Western Region

Sustainable Agriculture Research and Education

Following is an index of project summaries available in the 1999 Annual Report or earlier editions of Western SARE annual reports. The index organizes the summaries by topic or commodity, with corresponding project numbers. This should help you locate efforts of particular interest.

To search for summaries by project number or commodity in any region, go to **http://www.sare.org** and click on "Funded Projects." For archived reports from earlier editions of the Annual Report, go to **http://wsare.usu.edu** and click on "Pubs and Databases," or contact the public information office at (530) 752-5987 or kkelleher@ucdavis.edu

A project may be appropriate for more than one category, however, each project is mentioned only once by topic.

Ranching, Crop/ Livestock, Dairy

✓ = Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

AW93-011
Calibration of the Pre-sidedress Soil Nitrate Test to Improve Nitrogen Management of Dairy Farms (Final results in 1996 Annual Report)

SW92-031
Grazing Strategies for Sustainable Ranching Systems in Western Semi-Arid Zones (Final results in 1996 Annual Report)

SW91-024
Specifying and Analyzing Whole Ranch Systems for Sustainable Range Livestock Reduction in Environmentally Sensitive Areas (Final results in 1994-95 Annual Report)

Sustainable Agriculture Systems

AW93-013
A High-Input Crop Production System in Coastal California as a Model for Developing Indicators of Agro-ecosystem Sustainability (Final results in 1994-95 Annual Report)

AW92-008
Development and Evaluation of Indicators for Agro-ecosystem Health (Final results in 1994-95 Annual Report)

SW88-001
Evaluation and Design of Low-Input Sustainable Vegetable / Small Grain and Small Fruit Systems of Western Oregon and Washington (Final results in 1994-95 Annual Report)

Cover Cropping

✓ SW97-045
Decomposition and Nutrient Release Dynamics of Cover Crop Materials (Annual results)

✓ SW97-011
Sustainable Crop Production Practices with Mixed Leguminous and Non-Leguminous Cover Crops (Annual results)

✓ SW96-029
Potential of a Corn/Annual Medic Intercropping System for Weed Control, Reduced Soil Erosion and Improved Forage Production (Annual results)

AW96-019
Influence of Cover Crop Vegetation on Symphylan Density in Vegetable Production Systems in the Pacific Northwest (Annual results in 1997-98 Annual Report). (See also AW94-033 in 1996 Annual Report.)

✓ SW95-012
A Cover Crop System for Sustainable Grape Production in California—Beyond the Transition Phase (Final results)

✓ SW94-008
Fall-planted Cover Crops in Western Washington: A Model for Sustainability Assessment (Final results)

✓ SW94-006
Legume Cover Crops in Fallow as an Integrated Crop/Livestock Alternative in the Northern and Central Great Plains (Final results). Also see below.

AW93-014

✓ = Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

Introduction of Cover Crops into Annual Rotations in Northern California (Final results in 1994-95 Annual Report)

SW91-026
A Cover Crop System for Vineyard Pest, Weed and Nutrition Management (Final results in 1994-95 Annual Report)

Soil Quality & Microbiology

✓ SW96-016
Tillage Practices for Improving Nitrogen Cycling and Soil Quality (in agricultural-intensive vegetable production) (Annual results). See also AW92-006.

✓ SW96-012
The Transition from Conventional, Low Input or Organic Farming Systems: Soil Biology, Soil Chemistry, Soil Physics, Energy Utilization, Economics and Risk (Annual results). This is a continuation of SW94-017 (Final results in the 1997-98 Annual Report). See SW89-018. Commodities include tomatoes, corn, beans and wheat.

✓ SW95-024
Managing Soil Biota in Low-Input and Organic Farming Systems to Enhance Soil Fertility (Annual results). See also SW94-017.

AW92-007
Role of Soil Microbial Biomass and Microbivorous Nematodes in Functioning of Sustainable Agriculture Systems (Final results in 1996 Annual Report)

AW92-006
Cover Crops Incorporated with Reduced Tillage on Semi-Permanent Beds: Impacts on Nitrate Leaching, Soil Fertility, Pests and Farm Profitability (Final results in 1996 Annual Report)

AW91-003
Canola and Rapeseed as Enhancers of Soil Nutrient Availability and Crop Productivity in Cereal Rotations (Final results in 1994-95 Annual Report)

SW89-018
A Comparison of Conventional, Low Input and Organic Farming Systems: The Transition and Long Term Viability (Final results in 1994-95 Annual Report)

SW88-001
Evaluation and Design of Low-Input Sustainable Vegetable / Small Grain and Small Fruit Systems of Western Oregon and Washington (Final results in 1994-95 Annual Report)

Vegetables

✓ SW97-074
Advancing Sustainable Potato Production in the Northwest (Annual results)

✓ SW95-025
Influence of Alternative Vegetable Systems on Beneficial Arthropods and Soil Biology Dynamics and Soil Quality Trajectory (Annual results)

✓ SW94-029
Development and Demonstration of Integrated Vegetable Production Systems for the Maritime Pacific Northwest (Final results)

✓ = Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

SW91-029
Development of Sustainable Potato Production Systems for the Pacific Northwest (Final results in 1994-95 Annual Report)

Fruits

SW96-013
Implementation and Assessment of Economic and Environmental Impact of a Weather Monitoring/ Pest and Disease Risk Assessment Network in Commercial Pear Production in Oregon (Annual results in 1997-98 Annual Report)

SW94-023
Apple Production Without the Input of Neuroactive Insecticides (Annual results in 1997-98 Annual Report)

AW92-009
Comparative Performance and Farm-level Function of Conventional and Certified Organic Apple Production Systems in California (Annual results in 1996 Annual Report)

SW89-017
Silvopastoral Options for Fruit Growers (Final results in 1994-95 Annual Report)

Grains

✓ SW97-056
Comparison of Pest Management Interactions in Spring Wheat-Cover Crop and Spring Wheat-Fallow Cropping Systems (Annual results)

✓ SW96-032
Identification of Management Practices and Cultivars for Organic Hard Winter Wheat Production (Annual results)

SW89-014
Low-Input Legume/Cereal Rotations for the Northern Great Plains-Intermountain Region (Final results in 1994-95 Annual Report)

Natural Resource Management, Including Soil Conservation

✓ SW97-012
No-till Forage Establishment to Improve Soil and Water Conservation and Reduce Associated Production Risks (Annual results)

✓ AW96-014
The Impact of Riparian Vegetation Filters on Western Soil and Water Quality: Nonpoint-Source Pollutants from Range and Croplands (Annual results)

✓ SW96-007
Reducing Environmental Contamination from Feedlot Manure in the South Platte River Basin through Agronomic, Economic and Social Analysis and Education (Annual results)

AW95-102
Cattle Grazing Dispersion Methods and Riparian Ecosystems (Final results in 1997-98 Annual Report)

✓ AW94-020
Rotational Management of Wetlands and Cropland in the Tulelake Basin (Annual results)

✓ = Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

AW94-003
Compatibility of Livestock and Water Birds on Improved Pastures (Annual results in 1997-98 Annual Report)

AW93-012
Range Monitoring in the Upper Stony Creek Watershed (Final results in 1997-98 Annual Report)

AW91-002
Integration of Aquaculture Into an Irrigated Farm to Improve Efficiency of Water and Nutrient Use (Final results in 1994-95 Annual Report)

Alternative Pest Control: Insects, Weeds, Disease

✓ SW97-049
Development and Implementation of Trap Cropping Strategies for Control of Hemipteran Pests in Pistachio Orchards (Annual results)

✓ SW97-021
Reducing Insecticide Use on Celery through Low-Input Pest Management Strategies (Annual results)

✓ SW97-018
Integrating Nematode-Resistant Crops into Sugar Beet Rotations (Annual results)

✓ AW96-013
Control of Leafy Spurge by Grazing Goats, A Demonstration (Annual results)

✓ AW96-009
Reduced Herbicide Use Through Mechanical Cultivation and Banding of Herbicides (Annual results)

AW96-004
Weed Suppression and Enhancement of Wildlife and Beneficial Insect Habitat in Center-Pivot-Irrigated Field Corners (Annual results in 1997-98 Annual Report)

✓ AW95-207
Application of *Pseudomonas corrugata* as a Seed Treatment to Suppress Ring Rot Disease of Potatoes (Annual results)

AW95-203
Non-Chemical Control of Bollworm and Pink Bollworm in Cotton and Automated Insect, Plant and Profit Analysis (Final results in 1997-98 Annual Report)

AW95-202
Development of a Farm-Wide System for Control of Many of the Principal Lepidopterous Pests of Tomatoes Based on Disruption of Premating-Pheromone Communication Between Male and Female Moths (Final results in 1997-98 Annual Report)

✓ SW95-021
Brassica Green Manure Systems for Weed, Nematode and Disease Control in Potatoes (Annual results)

✓ SW95-019
Development of a Farm-Wide System for Control of Many of the Principal Lepidopterous Pests of Grapes and Tree Fruits Based on Disruption of Premating Pheromone Communication Between Male and Female Moths (Final results)

SW91-028
A Multidisciplinary Approach to Evaluate and Aid the Transition from Conventional to Low Input Pest Management Systems in Stone Fruits (Final results in 1994-95 Annual Report)

✓= Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

SW91-027
Development of Winter Wheat Cover Crop Systems for Weed Control in Potatoes (Final results in 1994-95 Annual Report)

SW91-022
Brassica Utilization in Sugarbeet Rotations for Biological Control of Cyst Nematode (Final results in 1994-95 Annual Report)

AW91-005
Soil Bacteria to Control Jointed Goatgrass in Integrated Cropping Systems (Final results in 1996 Annual Report)

Composting

✓ AW94-010
Management of an On-farm Composting System (Final results)

Tropical Agriculture

✓ SW97-025
Sustainable Culture of the Edible Red Seaweed *Gracilaria parvispora* Abbott in Traditional Hawaiian Fishponds (Annual results)

✓ SW96-003
Evaluation of a Perennial Vegetable, Asparagus, as a New Commercial Crop for Hawaiian Farmers (Annual results)

✓ AW95-103
Orchard Alley Cropping in the Subhumid Tropics (Final results)

SW92-002
Integrated Hog Farming and Market Gardening for Small Farmers in Tropical Areas of the Western Region (Final results in 1994-95 Annual Report)

Professional Development for Agricultural Professionals

EW = Professional Development Program

✓ EW97-012
Compost Education and Information Access for Western Agriculture Western SARE Professional Development Project (Annual results)

✓ EW97-007
Sustainable Agriculture Youth Educators: Professional Development for Youth Program Leaders and Educators (Annual results)

✓ EW97-005
In-Depth Training and Work Experience on a Community Supported Agriculture (C.S.A.) Farm (Annual results)

✓ EW97-004
Developing an Educational Program for Teaching Science-Based Concepts of Grass Regrowth for Improved Grazing Management (Annual results)

✓ EW97-002
Sustainable Range and Pasture Livestock and Dairy Production Training for Resource Professionals (Annual results)

✓ = Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

✓ EW96-011
Professional Training in Biologically Integrated Orchard Systems (Final results)

✓ EW96-010
Sustainable Arid-Land Grazing Systems: Training for Managers of Public Lands and Reserves (Final results)

✓ EW96-006
Organic Food Production and Marketing: Tours and Resource Guide (Annual results)

✓ EW96-004
Extension Faculty Learning with Farmers - A Seminar Series on Sustainable Agriculture (Annual results)

✓ EW96-002
Improving Manure Management to Protect Water Quality in the Southwestern United States (Annual results)

✓ EW95-012
Sustainable Agriculture Training Project: A Model of Collaborative Learning (previously EW94-006) (Final results) Audience: Montana, Idaho, Eastern Washington and Utah.

✓ EW95-008
Sustainable Integrated Range Livestock and Crop Production Systems (Annual results)

✓ EW95-003
Agency Personnel Training in Riparian Monitoring and Management of Wildlife and Livestock in the Intermountain West (Final results)

EW95-002
Sustainable Noxious Weed Management on Northwestern Rangelands (Annual results in 1997-98 Annual Report)

EW94-018
Extension Sustainable Agriculture Training in Eight Western States (Final results in 1996 Annual Report)

✓ EW94-014 Continued
Training "Agents" in On-Farm Implementation of Sustainable Management Systems for Tropical Agriculture in Hawaii and the Pacific Region (Final results). This project has been granted a continuation. For final results of the original project, see the 1996 Annual Report.

EW94-008
Pacific Northwest Sustainable Agriculture Systems In-service Education Program (Final results in 1996 Annual Report)

EW94-003
Multidisciplinary On-site Training in Sustainable Agriculture (Final results in 1997-98 Annual Report). Companion project to SW94-17. Commodities include tomatoes, corn, wheat and beans.

Educational/ Information-Sharing

✓ SW97-043
Building Community Support for Agriculture on the Urban Edge (Annual results)

✓ SW97-034
Enhancing No-till and Conservation Farming Success through the Use of Case Studies, Conferences and Workshops to Facilitate Farmer-to-Farmer Learning in the Pacific Northwest (Annual results)

✓= Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

✓ SW96-019
Sustaining Agriculture and Community: Moving the Farm Improvement Club Program Beyond the Farm Gate (Annual results)

✓ SW96-010
Western Integrated Ranch/Farm Education (Annual results) (formerly SW94-034)

✓ EW96-009
Sustainable Soil Management—Educational Resources for Extension Professionals in California's San Joaquin Valley and Central Coast Regions (Annual results)

✓ EW95-015
A Consortium-based Sustainable Agriculture: Training Curriculum Plan (Final results)

EW95-001
Educational Video on Watershed Management Practices for Pinyon-Juniper Ecosystems, "Restoring the Promise." (Final results in 1997-98 Annual Report)

SW94-022
Western Region Community Supported Agriculture Conference (Final results in 1996 Annual Report)

EW94-009
Permaculture Systems Pamphlet (Final results in 1996 Annual Report)

AW93-010
Educational Video and Management of Pinyon-Juniper Ecosystems: A New Approach (Final results in 1994-95 Annual Report)

SW92-004
The Sustainable Farming Quarterly, A Regional Newsletter (Final results in 1996 Annual Report)

SW91-023
Farm Improvement Club Network for Sustainable Agriculture (Final results in 1994-95 Annual Report)

Quality of Life & Resource-Limited Producers

✓ SW96-027
The Production of New, Existing and Native Crops under Conventional and Organic Production Practices in Costilla, Garcia and Taos Pueblo (Annual results)

SW93-034
Four-Corners Navajo Nation Sustainable Agriculture Demonstration Project (Final results in 1997-98 Annual Report)

SW91-030
Assisting Resource-Poor, Small-scale Farmers with Adoption of Low-Input Technologies at the Rural Development Center (Final results in 1994-95 Annual Report)

✓ = Included in 1999 Annual Report. The Annual Report is on-line at **http://wsare.usu.edu/**

Western SARE

Research and Education

Western SARE: Annual Results :

Sustainable Agriculture Research and Education, SARE

Agriculture in Concert with the Environment, ACE

Western Region

Sustainable Agriculture Research and Education

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Annual Results

SW95-007

Sustainable Rangeland Based Beef Cattle Production Systems

Location:
Wyoming

Funding Period:
July 1995 –

Grant Award:
$155,260

Project Coordinator:
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Cooperators:
Bob Budd, Red Canyon Ranch, Lander
Scott Sims, S&S Ranch Co., McFadden
Jack Turnell, Pitchfork Ranch, Meeteetsee
Deseret Ranches, Cody
John Nunn, Needmore Land & Cattle Inc., Laramie
Troy Stafford, Riverton
Pete Scott, Two Bar Ranch, Casper
Kelly Land and Cattle Company, Saratoga

Objectives

1. Determine animal productivity, feed requirements, economic characteristics and inherent risks of herds calved at conventional early dates and later spring dates from: a) cooperator ranch herd records and during the period of this study, and b) experimentally from a portion of the University herd during the period of this study.

2. Determine the production and economic characteristics along with the financial feasibility of alternative winter forage resources or hay processing techniques, including baled or stacked hay, windrowing hay only and feeding from the windrow, and pastures planted to species such as Basin wildrye, *Elymus cinerius*, that provides forage accessible to cattle even with snow cover.

3. Conduct a technology transfer program that includes workshops, seminars and/or ranch tours, Extension publications, popular press and trade publication articles, news releases and refereed journal articles.

Abstract

The purposes of this project are to a) determine the differences between conventional late winter and late spring calving dates in the productivity, feed requirements, economic characteristics and risks; b) determine production and economic characteristics of alternative winter forage and hay processing techniques; and c) conduct technology transfer programs to convey results to producer and other audiences. This project has been underway for three funding years. The experimental portion has been successful and the producer information surveys and economic analysis are near completion. Technology transfer activities have been implemented.

Conventional and late breeding seasons were initiated on an experimental University owned herd in 1995. Weaning weights of these calves show a small advantage for the earlier calving dates. However the additional weight is not sufficiently large to compensate for the additional winter feeding required to support cows' nutritional needs for conventional late winter calving dates and the lower labor and higher percentage of late born calves weaned provide additional benefits.

The average calving date for 1996 and 1997 was March 11 for the early calvers vs. May 15 for the late calvers. In 1998 the average calving date for the early calvers shifted to March 22 and the late calvers stayed at May 15. As can be expected, bull calves were heavier than heifer calves at birth (92.4 vs. 83.7 lbs). Late calves were also significantly heavier than early calves at birth (89.3 vs. 83.9 lbs). The heavier birth weights of the late calves may be attributed to increased total digestible nutrients (TDN) and protein intake from the grazed forage during the pre-calving period.

Case studies describing management strategies and results of implementing late season calving of two selected cooperating ranches are complete and others are in preparation. Operating costs and return to capitol on case ranches have been achieved or projected to reach $0.45 to $0.50 per pound of marketed stocker calf compared to $0.80 to $1.00 per pound for operators calving at conventional times. Economic analysis of selected alternative means of providing winter forages are underway. Technology transfer efforts concerning the late calving concept and economic hypothesis supporting the concept have included presentations to Wyoming Stock Growers 1996 and 1998 annual meetings, Bighorn/Washakie County producers and Uinta County producers. Similar presentations are scheduled with Carbon County producers. In addition, two articles were prepared for and published or are in press for livestock producer weekly and monthly publications such as Wyoming Cow Country and Wyoming Stockman Farmer.

Economic Analysis

The focus of the economic analysis during 1998 was in two areas: 1) developing an optimization model which would compare annual feed costs of early and late calving cows, and 2) developing case studies profiling producers who practice late calving or other innovative cost reducing methods. Results from the feed cost study indicate a reduction in feeding costs as calving is delayed from traditional February and March calving seasons. June calving reduced feed costs by $32 over March calving based on estimates of forage quality and costs. The model provided the framework to identify characteristics of an operation which are better suited to early or late calving.

Producers practicing late calving are generally satisfied with the results. Feed and labor costs have significantly been reduced. Potential disadvantages such as smaller calves and conflicting labor demands with haying have been lower than anticipated. One concern expressed by producers about late calving that has not been resolved is conception rates.

A study assessing the viability of establishing basin wildrye is in progress. Production costs amortized over a 15-year period result in estimated annual cost of $15 per acre. Preliminary results suggest it is unlikely that replacing forage on good producing land for grazing basin wildrye would add to profitability. Basin wildrye establishment for winter grazing could only be economically justified if native grasses are typically rendered unavailable by snow cover, and if there is significant potential for increased forage yield.

Potential Benefits

We have attempted to provide as much economic information as available. In general, late calving as compared to conventional northern region calving dates appears to provide as good or better economic returns to ranchers. In addition non-farm resources and labor input to the operation will be reduced while management of basic ranch resources, grazable forages, will be intensified. An implied shift to more winter grazing will relieve growing season grazing pressure on rangelands with possible implications of improving ecological condition and watershed stability. These changes will reduce the risk of negative cash flows induced by fluctuations in cattle markets or unexpected increases in operational costs such as supplemental feeds, equipment, or fuel.

Farmer Adoption and Direct Impact

Changes in Practice: Changes in calving season as we have advocated involve a substantial and not easily made paradigm shift for most livestock producers. We have had relatively few producers who expressed a willingness to change. Publication and presentation of results to producers in recent months suggests that the argument for later calving may be more convincing as evidenced by a few additional ranchers entering a late calving program.

Operational Recommendations: We propose that cattle producers shift their calving season to the average date of maximum available digestible nutrients on the rangeland or pasture of their area so that peak nutrient demand of their cattle can be met with grazable forage. Subsequent winter nutrient requirements will be lowered to levels that can be met with grazable forages rather than hay and supplements. Winter feeding would be reduced to a few weeks in most years, average to low snow years. The largest benefit to the operation will be the reduction in winter feed costs, usually the largest expense to the ranch operation. Optimum returns from cattle raised under this regime will probably be realized from retaining ownership of calves at least until early the following spring or through the following summer and feedlot.

Reactions from Farmer or Ranchers

Our cooperators who calve in May and June express great satisfaction with the results they have achieved. Other more numerous ranchers who have shifted calving from March or earlier to April report that calf weights have not changed while they have reduced their winter feeding by at least a month from the five to six months previously. Additional producers have recently began calving at a later date suggesting the proposal is gaining favor in this era of perpetually low cattle prices.

Future Recommendations or New Hypotheses

The largest concern, after economic returns, of most ranchers confronted with the proposal to shift calving seasons is how to modify their grazing program especially on public land allotments. There may be opportunities for research into appropriate stocking rates and season of grazing effects due to newer grazing strategies.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

Sustainable Agriculture Research and Education

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Annual Results

SW95-015

Public-Land Grazing Permittees Under Pressure: Sustainability of Coping Strategies on Private Land

Location:
Utah

Funding Period:
July 1995 –

Grant Award:
$63,000

Project Coordinator:
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Major Participants:
John Workman, Rangeland Resources, USU
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Roger Banner, Rangeland Resources, USU
Karl Kler, Natural Resource Conservation Service, North Logan

Cooperators:
This project has used a telephone survey approach to collect information on whole-ranch operations. About 393 ranchers were contacted in the past three years, and they therefore qualify as cooperators.

Objectives

1. Confirm findings of Birkenfeld (1994) with respect to the proportions of proactive and passive permittees and determine the factor(s) that distinguish these two groups.

2. Determine the coping strategies that proactive producers use to intensify or diversify their operations, determine why such options are chosen, and classify and rank common strategies in terms of economic, environmental, and social criteria for sustainability.

3. Determine optimal patterns of ranch resource allocation (i.e., land, labor, capital, etc.) that would allow operations to simultaneously satisfy economic, environmental and social criteria for sustainability.

4. Determine critical constraints and trade-offs that prevent all sustainability criteria from being met, and identify technical or policy innovations that would help producers overcome constraints.

5. Communicate findings and recommendations to producers, researchers, extension, and policy makers.

Abstract

The overall purpose of this project is to determine the extent to which large-scale changes in management are occurring on privately owned grazing lands in Utah. Specifically, this includes identification of the types, extent, and causes of management change, the likely sustainability of new management practices, and implications for increased demand for technological and management innovations. Conventional wisdom in the early 1990s suggested that adoption of an aggressive "Range Reform" policy by the Clinton Administration had intensified fear among western range livestock producers that they would soon lose access to public grazing lands.

The average Utah public-land grazing permittee typically runs about 40 percent of his or her animal unit months (AUMs) on public grazing each year, which illustrates the high level of economic dependence such operators have on public land resources. Permittees are also a large component of range livestock producers in states such as Utah. It was thought that the acute fear of losing access to public land would encourage range livestock producers to intensify or otherwise alter their use of private land in order to increase carrying capacity as a compensatory survival tactic. Intensified use of private land would mean that demand for new technology and management systems would suddenly increase—this could include heightened interest in things like pasture forages, irrigation systems, educational materials on short-duration grazing, and range management innovations. It has been generally thought that over the past decades private grazing lands in the Intermountain West have been an underutilized and relatively ignored, high-value resource, ripe for major gains in productivity that could enhance animal agriculture in Utah. Understanding what drives producers to make changes and what characterizes innovative managers is important to help promote sustainability of agriculture in general and is the core theme of our project.

Our project is primarily based on social survey and economic analysis across large segments of the producer population in Utah. To date the following has been accomplished:

With funding from SARE and Utah State University, one socioeconomic survey of 192 Utah grazing permittees, each dependent on a mix of private and public lands, has been completed with the data fully analyzed and a master's thesis written and defended. With other leveraged funding from the U.S. Environ-

mental Protection Agency (EPA), a similar socioeconomic survey of another 201 Utah producers, dependent solely on private grazing lands, has been completed in terms of data collection, data analysis and production of a report for EPA that synthesizes results for both permittees and private-land-only (PLO) producers combined. The idea behind having the two surveys of different subpopulations of land managers was to see if the subpopulation dependent on public land would be engaged in more private-land improvements compared to the subpopulation solely dependent on private land. In addition, a master's level research project involving a detailed economic risk analysis of private-land intensification among permittees is well underway with completion targeted for July 1999.

In summary, producer strategies are dynamic over time. In the case of improved management of private grazing lands, adoption of new technology or management practices is not linear but rather episodic in nature. Downturns or up-turns in pro-active behavior across the population can be influenced by coincidences in micro-economic, macro-economic, demographic, and policy factors. For example, as long as federal policy on use of public grazing remains vague, vacillates, or supports the status quo, most permittees can be expected to remain as passive managers. As they continue to age and are not replaced by younger producers, passivity will continue to increase. Policies and factors which contribute to uncertainty in prices for animal products (i.e., such as free trade) may also contribute to economic disincentives for many producers to invest in improved land management for production, especially if economically superior options off-ranch compete for their investment dollars.

Potential Benefits

The impact of our project can only be addressed in terms of the final recommendations for policy makers with the goal of better formulating policy that enhances the sustainability of ranching in the Intermountain West. Prominently this would probably include more attention to policies that encourage a younger generation to take up ranching, make cost-share monies more available to producers, assist producers in better-managing risk and diversifying income, and reducing the cost of important grazing-based technologies.

Farmer Adoption and Direct Impact

This is not a technology-generation project per se. It is a project that investigates who seeks innovations, when and why. We hope to make policy recommendations that facilitate appropriate adoption of new technology and management systems. While these numbers are low they are reality. Low numbers do not necessarily imply that the situation is "bad." Low rates of adoption may be entirely appropriate under conditions of high economic risk and uncertainty (and high year-to-year environmental variation) when the economic well-being of most producers is already in a high-challenge situation. Indeed, those conservative producers who refrain from making risky investments in new technology may be the most sustainable producers when all is said and done ten years from now. We are revealing that policy, demographic, and economic forces, many beyond our control, likely dictate rates of technology adoption as they pertain to large-scale changes in the management of private grazing lands—in most cases just having new technology on the shelf will not elevate adoption rates. Our work in year three is devoted to analyzing the economic risks and returns to management intensification of private grazing lands. We expect to find that most low and middle-income ranchers would be unable to tolerate the risk involved in substantive, intensified use of private grazing lands in Utah. Risk-neutral producers who are wealthier tend to be the self-selected innovators. Coercing others to adopt new management systems under uncertainty or risk may lead to the economic demise of marginal operations.

Producer Involvement

192 Utah permittees participated in a phone survey in 1996. Calls averaged about 30 minutes in length. Our participation rate was about 98 percent. Another 201 PLO operators were called in a phone survey in late 1997. In sum, 393 operators have participated in this project.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region
Sustainable Agriculture Research and Education
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Annual Results

SW95-018

Extending the Grazing Season and Integrating Crops and Livestock to Sustain Small Farms and Ranches in the Southern Rockies

Location:
New Mexico and Colorado

Funding Period:
July 1995 –

Grant Award:
$141,602

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(continued)

Objectives

1. To determine the ability of forage *Brassicas* and oats (*Avena sativa L.*) to provide late-season forage and hairy vetch and winter rye (*Secale cereale L.*) to provide early-season forage when overseeded into sweet corn stalks.

2. To determine the profitability of overseeding forage *Brassicas*, oats, hairy vetch and winter rye into sweet corn stalks in terms of heifer average daily gain.

3. To determine the ability of forage *Brassicas* and spring oats overseeded into established pastures to provide increased late-season forage.

4. To disseminate to farmers and ranchers the results of the project.

Abstract

The primary goal of our project is to develop forage production systems which extend the grazing season in the fall and provide more forage in the spring through overseeding of vegetable crops and irrigated pastures and increased integration of crops and livestock. Overseeded species tested have included forage *Brassicas*, hairy vetch, winter rye, spring and winter oats, and triticale. The project includes a grazing study to determine the profitability of overseeding several of these crops into sweet corn to increase the forage value of the stover after sweet corn harvest. In this grazing study, the second complete cycle of grazing was completed in fall 1997 and spring 1998. Sweet corn was harvested in August. Corn stover and annual forages were sampled in early November and grazing trials were conducted immediately thereafter. Paddocks were intensively grazed for four to five weeks. Sweet corn unhusked ear yields averaged across both years were 16.4, 17.4 and 14.3 Mg/ha for control, oats, and turnips, respectively. Yield was significantly lower ($P<0.05$) for the turnip treatment. Cattle average daily gain (ADG) and total gain per hectare were not significantly improved by interseeding annual forages. However, total available forage biomass was increased from 42 to 81 percent by interseeding oats or turnips, and overall nutritional quality of the pasture was improved. These results indicate that sweet corn stover could be grazed either more intensively or for an extended period of time when annual forages are interseeded. Profitability of overseeding into the corn is being determined. Trials have been carried out at various farmer/rancher cooperator sites throughout the region and at the Alcalde Center in which pastures have been overseeded with various summer- and/or winter-annual forages. Establishment of the annual forages has ranged from poor at some sites to excellent at other sites.

Crop residues are frequently grazed to add economic value to them. However, they are generally of low forage quality. Sweet corn in particular is a high-value vegetable crop which leaves significant amounts of residue after the ears are harvested. Overseeding a second crop of high forage quality into the corn could potentially increase the ability of these residues to support livestock. Sweet corn was overseeded with annual forages in July of 1996 and 1997. Grazing treatments were corn stover alone, stover + oats, and stover + turnips for fall, grazed from mid-November to mid-December. Stover + rye was grazed from mid-April to mid-May, and stover + hairy vetch was grazed from mid-April to late May. Stocking rates were about five heifers/acre. Data analyzed so far indicate that stocker heifer average daily gains were not significantly different among fall grazing treatments (stover alone, stover + oats, and stover + turnips) in 1996 or 1997, and generally were slightly above one pound gain per day. However, total available forage biomass was increased from 42 to 81 percent by interseeding oats or turnips, and overall nutritional

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quality of the pasture was improved. These results indicate that sweet corn stover could be grazed either more intensively or for an extended period of time when annual forages are interseeded.

Not unexpectedly, and consistent with information in the literature, overseeding annual forages into irrigated pastures without herbicides and/or expensive no-till seeding equipment is the most difficult part of the project. However, for most of the producers in the region who have irrigated pastures or meadows, this is one of the few practices they would be able and/or willing to undertake to extend the grazing season on these fields. In 1998, we were able to overseed into New Mexico pastures at or near Canjilon Zuni Pueblo and Ignacio. Some of the overseeded forages have the potential to overwinter and thus potentially provide increased forage the following spring. For example, hairy vetch, rye, and turnip were seeded during summer 1997 at Canjilon. Although observations indicated little growth had occurred by fall 1997, samples taken from this site the following June showed more significant growth for the hairy vetch and rye. In fact, we are finding through these trials that the use of winter-annual forages, especially in the higher elevations where growing seasons are shorter, may offer a better chance to extend the grazing season of pastures through increased productivity the following spring or summer.

Potential Benefits

Although we do not have most of the field data analyzed to make conclusive statements regarding positive benefits or impacts, results to date from the grazing study indicate that significantly more forage is available for livestock grazing corn stover overseeded with turnips or oats compared with grazing the stover alone. If these results hold through the remaining cycle of the project, they would indicate that overseeding annual forages resulted in an increase in available forage per unit area under grazing conditions.

This summary was prepared by the coordinator for the 1999 reporting cycle.

Western Region

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Annual Results

SW95-021

Brassica Green Manure Systems for Weed, Nematode and Disease Control in Potatoes

Location:
Washington and Idaho

Funding Period:
July 1995 –

Grant Award:
$112,580

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Objectives

1. Determine the efficacy of *Brassica* green manure systems for disease, nematode, and weed control in potatoes.

2. Determine the nitrogen contributions from *Brassica* green manures.

3. Conduct an economic analysis of *Brassica* green manure systems compared to costs of current pest and nitrogen management practices.

4. Demonstrate the *Brassica* green manure system to potato growers, fieldmen, and extension educators through use of on-farm trials, seminars, workshops, extension publications, and a video.

Abstract

Alternative pest control practices are needed to convert potato production from a high-input, synthetic chemical based system to a lower input system. *Brassica* green manures have shown potential for providing biological control of several common potato pests, including soil borne diseases, nematodes, and weeds. *Brassica* species contain glucosinolates, sulfur containing compounds that are enzymatically hydrolyzed to toxic compounds when plant cells are disrupted. Three pest management systems were compared in a split plot design at three locations, Aberdeen, Idaho, Prosser, Washington, and Mt. Vernon, Washington. Main plots were low, medium, or high pest control input levels, and subplots were green manure treatments: no green manure, winter rape (*Brassica napus*), or white mustard (*Brassica hirta*).

Both winter rape and white mustard provided excellent fall, winter, and early spring ground cover, but winter rape provided better weed and disease suppression than white mustard. The winter rape green manure sometimes reduced biomass of specific weeds, but overall weed control was not commercially acceptable. However, a combination of green manure incorporation plus a low rate, postemergence herbicide application provided weed control similar to the high input, no green manure, standard practice treatment. Winter rape incorporation also suppressed Rhizoctonia and Verticillium wilt in potatoes compared to the no green manure treatment.

Nitrogen from winter rape was mineralized after incorporation, resulting in elevated soil nitrate levels in the top foot of soil during potato tuber initiation. Delayed tuber initiation was observed at both Aberdeen and Prosser as a result of this N release. U.S. No. 1 yields were not reduced by winter rape incorporation at Prosser or Mt. Vernon, but were reduced 43 percent compared to the no green manure control one out of two years at Aberdeen. The longer growing seasons at Prosser and Mt. Vernon may allow time for full recovery from N-delayed tuber initiation, while the shorter season at Aberdeen increases the potential for N-delayed tuber initiation to affect final tuber yield. Understanding how to manage nitrogen in the fall-planted, spring incorporated winter rape green manure system will be key for successful use of this system under short growing season conditions.

Presentations on the *Brassica* green manure system were given at the Weed Science Society of America Meetings (70 scientists and ag industry personnel), the Western Society of Weed Science Meetings (85 scientists, ag industry personnel, extension educators, growers, and consultants), and the Potato Association of America Meetings (125 scientists, extension educators, growers, consultants, and industry personnel).

Potential Benefits

The winter rape or white mustard green manure system provides excellent soil erosion control from three weeks after planting the green manure in August or September (depending on location) until potatoes are planted in April or May the following spring. Even after incorporation, the winter rape treatments still provide 25 to 35 percent cover from residue left on the soil surface. In addition, the green manure crop scavenges leached nitrogen and later releases it for use by the potato crop. The green manure system provides some early season weed suppression, but control is inadequate for using green manures alone as a weed management practice. However, the combination of green manure incorporation plus a low-rate, postemergence herbicide application provided good to excellent weed control. Using a green manure system also may reduce stem and tuber infection by Rhizoctonia and may reduce Verticillium wilt incidence.

Farmer Adoption and Direct Impact

In 1997, three growers in the Columbia Basin of Washington, Ron Reiman, Allen Olberding, and Cody Easterday, used a white mustard green manure. Reiman reported excellent weed suppression, lower nematode populations early in the season, and excellent ground cover with the white mustard green manure. He noted two potential drawbacks, increased wireworm populations and overwintering of green peach aphids if white mustard does not winter-kill.

Winter rape green manures have not been tested by Washington growers because of the concern that it is too weedy. In Idaho, additional nitrogen management studies are needed before a spring-incorporated winter rape green manure system can be recommended. Grower advisory committees were in place at each location (9 growers total). The growers reviewed research results, gave input on the project, and helped make decisions on how to improve the design of on-farm trials.

Future Recommendations or New Hypotheses

Nitrogen cycling data from this study suggest that under certain environmental conditions, nitrogen release by the incorporated green manure may be rapid. If rapid nitrogen release occurs during tuber initiation in potatoes, initiation may be delayed long enough to result in reduced yields in potato production areas with short growing seasons.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW95-024

Managing Soil Biota in Low-Input and Organic Farming Systems to Enhance Soil Fertility

Location:
California

Funding Period:
July 1995 –

Grant Award:
$175,000

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(continued)

Objectives

1. To measure long-term and seasonal changes in the light fraction pool of organic matter in four farming systems and relate these changes to microbial and soil fertility parameters.

2. To test the effect of C:N ratio of organic matter inputs on microbial biomass and community diversity, the abundances and ratio of fungal- and bacterial-feeding nematodes, nitrogen mineralization, labile organic matter pools, and crop productivity.

3. To enhance the rate of cover crop decomposition by fall management practices that enhance nematode populations in spring.

4. To measure nitrogen loss due to denitrification as a function of farming system and C:N ratio.

5. To determine causes and impacts of seasonal fluctuations in microbial biomass.

6. To provide analyses of microbial and nematode community size and structure to collaborators.

7. In collaboration with colleagues involved with outreach activities associated with the SAFS project (funded by a training grant), to develop educational material about the importance of soil biology in sustainable agriculture and farming practices that enhance soil communities.

Abstract

This project's major goals are to compare soil biological communities in conventional, low input and organic farming systems and to explore means to maintain agricultural productivity and enhance sustainability by managing the soil communities. The study was carried out at the Sustainable Agriculture Farming Systems (SAFS) project at UC Davis comparing two- and four-year rotations (including tomatoes, safflower, corn, wheat/beans), managed using conventional, low input or organic practices. We measured microbial community biomass and composition in soils under various crops and management. Some crops were associated with distinct microbial communities. Communities in wheat and bean soils were more different from communities in tomato, safflower and corn soils than were the latter three communities from one another. Systematic changes in community composition over the growing season observed in all farming systems in 1995 were also observed in 1996 and 1997. Studies on soil microarthropods showed that exclusion of the microarthropods reduced the rate of litter decomposition and increased the relative proportion of fungal feeding nematodes, which are competitors of mites and Collembola.

In a multi-year study of whether managing soil biotic populations can enhance soil fertility, field trials in the SAFS companion plots were continued for the third year. We added carbon (straw, straw plus summer cover crop, or straw plus winter cover crop) with or without fall irrigation. Nematode and microbial communities were measured, as well as soil nitrogen and yields of the following tomato crop. The ratio of bacterial:fungal-feeding nematodes was greater relative to the other treatments only when the soil was irrigated in the fall. Dry soil in the fall selected for fungal-feeding nematodes. Fall irrigation plus a late summer cover crop and/or straw application provided significantly greater available N and higher tomato yields the following spring than did treatments without fall irrigation or a late summer cover crop. Carbon inputs without irrigation had no effect on nitrogen or crop yields. We concluded that soil management practices in the late summer

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and early fall, when soil temperatures are conducive to biological activity, can increase densities of both microorganisms and bacterial-grazing nematodes in the spring with potential benefits for the tomato crop.

Outreach is a significant part of our project. We played a major role in two workshops put on by the BIOS (Biologically Integrated Orchard Study) project this past fall. This involved running afternoon workshops on the soil food web. Also, Dr. Ferris and Scow were keynote speakers and participated in a panel discussion on how to measure soil organisms in a Soil Biology workshop hosted by John Luna and Mary Stabens at Oregon State University. Dr. Ferris also conducted a laboratory section on nematodes. We are a central resource for the FARMS program, an educational outreach program for high school students, which provides exposure to and research opportunities in agriculture.

Potential Benefits

Our ultimate goal is to improve our understanding of the complex interactions between the availability of plant nutrients and the soil food web, specifically the microbial community and their nematode predators. As part of the larger USDA SARE funded project, "A Comparison of Conventional, Low Input and Organic Farming Systems: The Transition Phase and Long Term Viability," findings of our project have implications for the larger project. Management of the fertility of the organic farming system is one of the project's major challenges. One potential contribution is the finding that a relatively low cost management practice in the fall, irrigation, can lead to a 15 percent increase in available nitrogen from the cover crop. If adopted, such practices would diminish reliance on mineral fertilizers in the low input system, reduce the need for supplemental forms of fertilizers (e.g., foliar sprays) in the organic system, and may result in reduced leaching of N due to immobilization during the fall and winter in cover crop and soil biota biomass.

Farmer Adoption and Direct Impact

A significant impact of our studies has been changes in management of the winter cover crop in the SAFS main plot low-input and organic management systems. Previous approaches were to leave the soil bare and dry during the fall and to sow the winter cover crop in November, to be germinated by winter rains. More recent approaches involve planting the cover crop by mid-September and germinating it through irrigation, consistent with the results of our fall management project. This information has been shared with farmers and extension specialists at the numerous workshops in which we have been involved. Fall management of cover crops conceivably would diminish reliance on mineral fertilizers and may result in reduced leaching of N due to immobilization in cover crop and soil biota biomass during the fall and winter.

Another impact of our project is that our presentations and workshops at numerous outreach activities have promoted a dialogue with, and generated feedback from, growers about the importance of soil biology in agriculture and about methods for measuring measure soil organisms. Many growers are now having their soils analyzed for microbial populations and nematodes. Through our research we are providing information to help growers determine the usefulness of such measurements, which technologies to use, and how to interpret these results in the context of soil quality. Both Scow and Ferris have been and continue to be involved in numerous outreach activities concerned with this topic.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW95-025

Influence of Alternative Vegetable Systems on Beneficial Arthropods and Soil Biology Dynamics and Soil Quality Trajectory

Location:
Oregon

Funding Period:
July 1995 –

Grant Award:
$180,000

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Keith Grover, Farmer, Salem
Carl and Nancy Hendricks, Farmers, Scio
Peter and Tina Kenagy, Farmers, Albany
Ron and Larry Pearmine, Farmers, Gervais
Dale Lucht, Farmer, Molalla

Objectives

1. To identify and explore sensitive early indicators of changes in soil quality useful to agroecosystem analysis and farm management.

2. To identify and explore linkages between changes in vegetation/soil management and associated C inputs with soil community structure and processes, and above ground arthropods dynamics.

3. To test and adopt strategies for conducting participatory research and education programs.

Abstract

This is an in-depth study in western Oregon of soil quality, soil biology and above ground arthropods in alternative vegetable systems that includes cover crops and reduced tillage. The work was conducted at two experiment station research sites (fully replicated with statistically valid experiments initiated in 1989 and 1993) and on five farmers' fields who split their field into two management systems.

We have identified that certain soil enzyme activities and increases in large aggregates fractions (1 to 2 mm) are early indicators of changes in soil quality due to improved soil management. A cotton strip decomposition method was tested as a simple measure of soil biology activity but it was concluded that it must be used under the same environmental conditions each year to give comparable results. These results are encouraging in that certain microbial and physical properties are sensitive to changes after only one year of a change in management which hold potential to guide farmers to manage soil for long-term sustainability. Furthermore, use of cover crop systems is improving soil quantity that is quantifiable. To date, there is evidence that suggests that microbial communities are affected by cover cropping practices.

Earthworms appear to be stimulated by cover cropping even under conventional tillage, but more in-depth studies are needed to confirm this. Nutrient-mobilizing species such as fungus-feeding springtails and mites are conserved by cover crops and reduced tillage. Deposition of green manure cover crops on the soil surface supports high populations of a mite (*Pergamasus*) which is currently being developed as a bio-control agent of symphylans.

Our study of the long-term impacts of tillage and vegetation management on above ground arthropods has focused on the four taxonomic groups, spiders (*Araneae*), harvestmen (*Opillones*: *Phalangiidae*), ground beetles (*Coleoptera*: *Carabidae*), and rove beetles (*Coleoptera*: *Staphylinidae*). These groups are predators, rich in species, sensitive to soil management, and have inherent value in the agricultural ecosystem. The beneficial predator, *P. melanarius* (ground beetle) was conserved in cover crop systems. *P. algidus* was present in the cover crop system and absent in the clean-tilled system at the OSU Vegetable Farm. Each taxa was dominated by a few species. Each species responded in a unique manner to habitat choices and the level of disturbance in the cropping systems. Diversity of beneficial predaceous species is often tied to distance from perennial crops/plants at the edges of fields. Spring tilling interrupts the life cycle of one of the two major beneficial predaceous beetles.

A major accomplishment of the project was the development of a soil quality card and an accompanying guide that was done at farmer focus sessions. Besides being now available as a tool for farmers to assess their own soil quality, the participating farmers in our study are using the card to evaluate the two systems they are testing. This is providing a rich data set that can be compared to the more rigorous lab based measurements.

Although we have only preliminary results from the research, we have extended the results in various workshops and popular outlets. It has been well received and is providing information that will give farmers confidence that adopting certain sustainable practices can improve soil quality. We have had extensive interactions with our 8 grower participants. This has been a learning experience for both scientists and farmers as we worked to set up the experimental splits, and begin sampling and measuring soil properties and insect levels.

Potential Benefits

It is early in the project to determine potential impacts. Identification of sensitive soil quality indicators holds potential to assist farmers in determining which management practices are improving their soils. We suspect earthworms respond to cover cropping and that they play a part in the improvements that appear to be happening in soils. We are finding that cover cropping conserves certain beneficial predators and this has implications for reducing the amount of pesticides that are needed.

Farmer Adoption and Direct Impact

Farmers have been asking us for methods that quantify whether management has been improving or degrading soils before it impacts crop productivity. Our work is demonstrating that cover cropping can have a positive impact on soil properties and we are demonstrating this in cooperation with farmers. This indicates that at least for our cooperating farmers including cover crops is economically feasible. This is providing convincing evidence for farmers to adopt cover crop systems.

The eight growers have been closely involved with each designing and implementing an improved systems on one-half of the field and a conventional systems on the other half. They are also filling out the Soil Quality Scorecard on each treatment. We had involvement with approximately 35 to 40 growers in the development of the Willamette Valley Soil Quality Scorecard. This has been an extremely successful project and besides developing the card has provided numerous learning experiences for both farmers and scientists in how to manage soils to improve soil quality and how to quantify these improvements with more subjective means.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW96-003

Evaluation of a Perennial Vegetable, Asparagus, as a New Commercial Crop for Hawaiian Farmers

Location:
Hawaii

Funding Period:
July 1996 –

Grant Award:
$49,595

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Objectives

1. Establish appropriate irrigation and fertilization practices.
2. Determine plant density for viable commercial production in Hawaii.
3. Provide least toxic management of insect and mite pests, diseases, parasitic nematodes, and weeds.
4. Determine the cost of production, number of harvests per year, yield per acre and profitability.
5. Disseminate the information gathered from the project to growers through field days, publications, and seminars.

Abstract

During the first year the asparagus planting layout was established and plants were started and transplanted to the field. Proposed crop maintenance procedures were followed and the crop growth and health was observed and reported. At the end of 1997, the first harvest took place and the results were made available to farmers. It was a short harvest period with a relatively small yield as expected for first asparagus harvests. Following the first harvest in December 1998, the asparagus ferns were allowed to regrow. Nitrogen fertilizer was applied through the drip irrigation system at a rate of 5 gal of 11-37-0 fertilizer and additional urea to bring the total nitrogen to 40 lb nitrogen per acre. There were no disease or insect problems requiring fungicide or insecticide applications. Ferns grew rapidly and quickly closed in the field so that no weed problems existed.

The second harvest took place August 10 to 31, 1998. The second harvest was much larger and yielded useful data which is being supplied to local growers through the Oahu state extension service. During the second harvest, a field day was held and extension agents, Hawaiian farmers and other interested persons were invited. The number of visitors was larger than expected and they had many questions regarding the planting, maintaining, and marketing of asparagus.

The irrigation schedule for the project was dictated by the availability of water. The project area was irrigated for 14 hours every other day. This proved to be quite sufficient for this location. During the first year of the project two different fertilizer rates were tested. The results showed that there was no difference in yield between the two so after the first harvest the entire project area received the lower rate. Fertilizer applied was 11-37-0 and urea for a total per crop of 81 lb phosphorus per acre and 80 lb nitrogen per acre.

The asparagus transplants were planted in the field at a density of one plant per foot in lines four feet apart. This proved to be suitable spacing and as the ferns grew, the canopy closed in sufficiently to shade out weeds. Asparagus produces an extensive root mass that continues to spread and remains productive for years.

Asparagus is a very low maintenance crop with few nematode, insect or disease problems. During the first year of growth there was one *Cercospora* blight outbreak requiring fungicide treatment, but no problems were encountered during the second six month growth period. Weeds did not require any additional control procedures.

It appears so far that with sufficient irrigation and fertilization two harvests per year can be expected in Hawaii. It remains to be seen whether this will be sustainable over the three year test period. The first two harvests did not reach potential production capacity, although the second harvest was much larger than the first. Yields per acre and overall production costs and profitability will be calculated for the final report.

One of the major problems for Hawaiian asparagus growers will be to develop a local market for their produce. The cooperating farmer made some sales outlet contacts for his second crop. The selling point is the fresher quality and better taste of locally grown asparagus. The third harvest is planned for January 1999 when no imported asparagus is available in Hawaii. A large supermarket chain has agreed to take all of Mr. Agader's January crop. It is clear that an expanding local market is available and buyers are learning that they prefer the fresh local asparagus. Directly or indirectly as a result of this SARE project the acreage being planted to asparagus is increasing in Hawaii and several new farms have been planted within the last year.

The yield data collected from data plots were analyzed statistically to give weights, size ranges and spear numbers for the various treatments. This information is being made available to the cooperating extension agent who will disseminate it to growers in Hawaii. Several media events took place. Dr. Schenck was invited to speak on a Japanese language radio broadcast (with translator) about asparagus and other alternative crops in Hawaii. Both Dr. Schenck and Mr. Agader appeared in two successive television programs of a local gardening show. These were filmed both in the asparagus field and in the laboratory and were taped on a video which can be replayed for those interested. Dr. Schenck attended a conference of the Hawaii Organic Farmers Association (HOFA) and showed photos and gave information to the organic growers about asparagus. Although organic farming is still a small sector of Hawaii's agriculture, it is growing and asparagus is a sustainable crop for organic production.

Potential Benefits

Many agricultural workers in Hawaii that previously worked for the sugarcane and pineapple companies are no longer employed with them since these large plantations have significantly reduced their acreage. Some of these workers have turned to small farming operations in many cases and are thus in need of information and assistance in developing new crops and markets for their produce. This project was undertaken to educate and inform Hawaiian farmers about asparagus which has great potential as a profitable alternative crop for Hawaii. Not only can it fill a local market that is now supplied by imported asparagus, it is a low maintenance, sustainable crop with little need of pesticides and with good soil erosion control. The extensive root mass that develops keeps soil in place and does not require plowing or replanting. Once planted, the farm remains productive for 15 to 20 years. In Hawaii, unlike temperate regions, harvests can be scheduled at any time of year when supply is low and prices are high.

Farmer Adoption and Direct Impact

The SARE asparagus project is one-half acre in size. The cooperating farmer was satisfied with asparagus and has decided to expand his acreage. He has now planted two additional acres and plans to put in another two acres. He will stagger the harvest times so that he can supply the market for a six month period each year.

Since the SARE project was begun, other Hawaiian farmers have started to plant asparagus also. Whether this was a direct result of observing the SARE project or by word of mouth, asparagus production is expanding in Hawaii. Several more small farmers in the vicinity of the project have planted asparagus. A large farm of 25 to 30 acres has been started on the island of Kauai. Many of the farmers that visited the SARE project field day in August 1998 expressed an interest in the crop. Some planned small home gardens for sale in farmers' markets and some were larger scale commercial farmers.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region
Sustainable Agriculture Research and Education

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Annual Results

SW96-007

Reducing Environmental Contamination from Feedlot Manure in the South Platte River Basin through Agronomic, Economic, and Social Analysis and Education

Location: Colorado

Funding Period: July 1996 –

Grant Award: $206,000

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Jim Self, Soil, Water, & Plant Testing Lab
Tim Stanton, Dept. of Animal Science

Cooperators:
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David Bossie, George Breniman, Brian Wells, Weld Laboratories, Greeley
Mark Crookston, Northern Colorado Water Conservancy District, Loveland
Ron Ditson, Grower, Fort Lupton

(continued)

Objectives

1. Determine optimum feedlot manure application rates and accompanying nitrogen (N) fertilizer needs for silage corn and to use the pre-sidedress soil nitrate test and the chlorophyll meter as a guide for in-season N recommendations in manured fields.

2. Determine crop water use and nitrate loss below the root zone as a function of manure application rate and timing.

3. Evaluate the effect of manure rates on soil quality and microbial populations and on pest populations (weeds, diseases, insects) and management recommendations.

4. Compute the costs and returns to alternative management schemes, determine economic returns and constraints for hauling, and understand the decision-making processes and relationships of persons and organizations in the chain from feedlot stocks of manure to potential users of manure as a fertilizer.

Educational Objectives

1. Change the perception of manure as a waste to its being viewed as a valuable resource and to increase the use of manure credits so that applications will be made at agronomic rates and environmental problems minimized.

2. Encourage feedlot operators to conduct manure testing and to give the nutrient analysis of each load to the recipient.

3. Train manure haulers/spreaders in calibration of their equipment and proper application techniques.

4. Teach consultants, fertilizer dealers, and producers to base fertilizer recommendations on soil testing, manure analysis and calibration, the pre-sidedress soil nitrate test, and chlorophyll meter measurements.

Abstract

Two corn fields on different private farms were used to measure effects of manure applications on crop growth and soil quality. In both years we used field TB1, a field with clayey soil and no previous history of manure applications. Fields with long histories of manure application were also used; in 1997 we used field JP1, in 1998, RD1. Both of those fields had sandy soils. The fields received four manure treatments (0, 10, 20, and 30 tons per acre fresh weight) and two sidedress nitrogen rates (0 and 50 lbs nitrogen per acre) in the spring of 1998.

Soil and corn plant samples were collected throughout the growing season to provide a picture of nutrient availability, crop water use, and nitrogen dynamics in the soil under different manure rates Weed, disease, and insect populations were measured, as were soil microbial activity and earthworm populations. The 1998 yield and end-of-season soil and plant data are currently being collected and analyzed. In 1997 we found that manure increased yields at TB1 (no previous manure), probably from increased water-holding capacity in a year when water was deficient from weed pressure and sprinkler problems. The field also suffered serious hail damage; it is possible some soil effects from the manure had a positive effect on recovery. Although the field had a lot of nitrogen in the subsoil from previous years' fertilizer applications,

Tom Haren Livestock Association, Denver
Steve and Judy Kelly, Manure Haulers, Lucerne
Jim Park, Grower, Kersey
Robert Reynolds, Monfort Feedlots, Inc., Greeley
Marvin Shaffer, USDA-ARS, Fort Collins
Dan Webster, Webster Feed Lots, Greeley

there was no movement of manure-N below a depth of 90 cm in 1997, probably related to the clay content of the soil.

Preliminary results suggest that soil microbial activity increased with application of manure at TB1, but not at RD1; activity at TB1 was generally higher than at RD1. Earthworm populations from spring and fall soil samples were very low; manure effects on earthworm population are not evident.

We have found no significant increases of weeds or corn rootworm from the manure additions at either site. In fact, in 1998, TB1 had a lower proso millet population with increasing amounts of manure. RD1, with a long history of manuring, actually had no weeds in the early growing season. Preliminary data suggest stalk rot occurrence increased with manure application, however, these data have not yet been statistically analyzed. Manure promoted microbial activity at TB1 in the spring of 1998. The two 1998 fields had extreme differences in weed populations. TB1 had ten weed species, nine of which had also appeared in 1997. RD1 had no weed seedlings at the time of sampling; this is probably due to a cover crop of winter wheat and a pre-emergence herbicide applied when the wheat was killed off at planting. This contradicts commonly heard beliefs that manure applications lead to weed problems.

A survey was developed, tested, and implemented that asks farmers their practices, experiences, and views of manure use in crop production. The questionnaire was sent to about 1,100 farmers in mid-November; results will be reported in 1999. Data that were collected on farming operation costs will be used to develop budget scenarios.

Four fact sheets were developed to provide information on manure analysis and recommendations to growers; a fifth one on manure spreader calibration is in press.

Potential Benefits

Because the field aspects of the project are still underway we cannot yet quantify the benefits from it. We expect that the outcomes will be better optimization of manure applications to plant needs, which should reduce the chances of nitrate leaching into groundwater supplies, and perhaps higher plant yields. Improving manure handling and increasing the perception of it as a high-quality plant food may increase the use of manure, in terms of both numbers of farmers and distance utilized from manure sources.

Reactions from Farmers and Ranchers

Response from wheat farmers regarding using manure to restore eroded soils was generally positive. Their main concern was having access to manure at a reasonable price.

After the 1997 field results were analyzed we met with the growers on whose fields the research had been conducted and presented the results of the season, focusing on each grower's field. They were extremely interested in the data from their fields and very positive about receiving them. The concept of nitrogen budgeting made a special impact. Data from the research plots and from adjacent areas in the same fields indicate excessive nitrogen use; the growers intend to include nitrogen from manure and irrigation water in their nitrogen budgeting.

Producer Involvement

We have three growers/feedlot operators who have allowed us to use their corn fields for the research objectives. They and three manure haulers/feedlot operators provide us with information about the business, guide our investigations, and keep us focused on the practical issues.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

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Annual Results

SW96-010
(formerly SARE #94-034)

Western Integrated Ranch/Farm Education

Location:
Idaho

Funding Period:
July 1996 –

Grant Award:
$36,326

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Chad Cheyney, UICE
Jim Hawkins, UICE
Steve Harrison, UICE
Rauhn Panting, UICE
Wilson Gray, UICE
Richard Gerrard, UICE
Dave Barton, UICE
Frank Henderson, University of Wyoming Cooperative Extension (UWCE)
Jim Jacobs, UWCE
Jay Jenkins, UWCE
Randy Weigel, UWCE
Richard Gray, Farmer, Warbonnet Ranch, Moorecroft, WY

Objectives

1. Teach ranchers/farmers a process of integrated management—Western Integrated Ranch/Farm Education (WIRE)—in one additional western state: Idaho.

2. Develop/provide additional in-depth follow up training in specific resource areas, to meet needs identified by program participants.

3. Continue to evaluate the program in terms of adoption of management concepts and resource sustainability following implementation of the WIRE process by selected cooperators.

Abstract

Several major accomplishments were achieved during this the first year for offering WIRE programs in Idaho. The first hurdle for the program was development of a teaching team. To this end, a full five-day WIRE course was offered by the Wyoming WIRE team in Idaho Falls, Idaho in December 1996. In addition, an introduction to WIRE was made to the Idaho Agricultural County Agents Association (IACAA) annual meeting in Salmon, Idaho. As a result, seven county agents and three specialists came together to form Idaho's WIRE team.

A team training, was held for the Idaho team in September 1997. This eight-hour training prepared members of the Idaho team to offer the full 45-hour WIRE course. During the training, the team scheduled two WIRE courses to be offered in the coming months of December and January. An intense period of preparation followed the team training, but this paid off with a successful first offering in Montpelier, Idaho.

Benefits of the program already apparent to the instructors range from getting people to think, to having groups change the management of their operations. Several operations will now do a better job of tracking their financial situation as a result of attending the course. A number of producers are also asking for more information on range analysis and stocking rates. Most of the individuals who attended a WIRE course are now setting goals for the first time in their respective operation's history. This will do more for these operations than any other one thing they could have done.

To date, the findings of this project (in all states) have been disseminated by several methods: popular press articles, WWW pages, satellite and videotape presentations, and through the offerings of WIRE courses. Popular press articles reaching producers' mailboxes across the West have been published on the WIRE program.

Also, through the annual regional coordinating committee meetings, state team leaders have shared experiences of participants and teachers from WIRE courses. These experiences and learning have been incorporated into the offerings of WIRE courses, thus immediately benefiting course participants.

Finally, meetings with other producer audiences have also provided forums for disseminating information about the WIRE program and techniques. Posters, presentations using the WIRE case study video, television advertisements, and other techniques have generally made producers in the participating states more aware of the availability of the integrated management program.

Potential Benefits

A number of producers are also asking for more information on range analysis and stocking rates. Seven operations asked specifically for range evaluation assistance. Most participants talk of needing help doing

a good inventory of resources. Monitoring requests for assistance will tell whether or not these interests are real as time progresses.

Several ranches are now entertaining ideas of new enterprises for their operations. One operator owns three miles of shoreline along a popular fishing reservoir. As per our human inventory, we found that one of the wives of the owners had run a camping enterprise with her parents. The ranch is considering a new business which would allow her to offer camping along the shoreline of the lake for additional income to the operation. Other producers were thinking of additional enterprises for their respective situations as a direct result of the WIRE class.

Reactions from Farmers and Ranchers

Selected testimonials and participant comments gleaned from evaluations of the first Idaho WIRE programs offered under the SARE project include:

"Overall it was great! I would like to know more about how and where we can get help to implement changes we make—range monitoring, finance, etc. We learned a lot that we WILL use. We have already identified several areas we need to start on."

"I have learned to put my time to better use in strategic, tactical, and operational uses. Thanks, I enjoyed it all. I would love to do it again."

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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Sustainable Agriculture Research and Education

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Annual Results

SW96-012

The Transition from Conventional to Low-Input or Organic Farming Systems: Soil Biology, Soil Chemistry, Soil Physics, Energy Utilization, Economics and Risk

Location:
Sacramento Valley, California

Funding Period:
July 1996 –

Grant Award:
$200,000

Project Coordinator:
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Tom Lanini, Weed Management
Jeff Mitchell, Water Relations

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Durga D. Poudel, Research Manager

Cooperators:
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Bruce Jaffee, Nematology, UCD
Don Phillips and Lee Jackson, Agronomy, UCD
Tom Kearney and Gene Miyao, Cooperative Extension Farm Advisors, Yolo County
Jim Durst, Farmer, Esparto
Bruce Rominger, Farmer,

(continued)

Objectives

1. Compare four farming systems, with differing levels of dependence on external resources over a twelve year period, with respect to:
   a. Abundance and diversity of weed, pathogen, arthropod and nematode populations.
   b. Changes in soil biology, physics, chemistry, and water relations.
   c. Crop growth, yield and quality as influenced by different pest management, agronomic and rotational schemes.
   d. Economic viability.

2. Evaluate existing and/or novel sustainable and organic farming tactics.

3. Distribute and facilitate adoption of information generated by this project to all interested parties as it becomes available.

Abstract

The Sustainable Agriculture Farming Systems (SAFS) Project was established to study the transition from conventional to low-input and organic practices. Treatments include three, four-year rotations under conventional (conv-4), low-input, and organic management and a conventionally-managed, two-year rotation (conv-2). Crop yields in all systems have been near or above Yolo county averages throughout the study. Farming systems have shown significant differences in the levels of sub-surface (15 to 30 cm) mineral nitrogen in the fall following crop harvest. Nitrogen (N) availability and weed competition have been the most important factors limiting yields in the organic and low-input systems. Positive effects on soil quality resulting from low-input and organic management include increased soil organic matter, increased pools of phosphorous (P) and potassium (K), higher microbial biomass and activity, increase in mobile humic acids, and increased water infiltration rates and water-holding capacity. All of the farming systems except the organic system have used pesticides to some degree, but pesticide use in the low-input cropping system is 0 to 50 percent of that used in the conventional systems.

The most profitable farming system continues to be the conv-2 system due to the greater frequency of tomato in that rotation. Among the four-year rotations, the organic system with price premiums is most profitable while the organic system without premiums is least profitable. The low-input corn system, which uses about 50 percent less pesticide and fertilizer inputs, has emerged as an agronomically superior and economically viable alternative to conventional production. New research efforts are focusing on developing reduced-tillage tomato production methods, nonchemical and low-chemical weed control tactics, and cover crop management strategies to optimize N availability following cash crops. In addition, research is underway to quantify the contribution of cover crop N to the following cash crop in the low-input and organic systems and to measure the impact of farming system management on soil biota and the associated effects on soil fertility and pest management. We have found that in both the low-input and organic treatments, legume cover crops fix approximately 66 percent of nitrogen from the atmosphere.

Information generated from SAFS research has been disseminated through a new video, workshops, annual field days, field tours, educational materials, peer-reviewed articles, and a World Wide Web homepage. The project was the host site for AgTech98, the annual UC Davis showcase of important research and technology. Interest in the findings of the SAFS project by farmers, industry, researchers, and the general public continues to increase.

Winters
Ed Sills, Farmer, Pleasant Grove Farms, Pleasant Grove

Collaborators, Students, and Visiting Researchers from UCD:

Enio Campiglia, Alfonso Pio Rosell Migone and Wendy Rausch, Agronomy
Sean Lau, Rob Venette and Carl Chen, Nematology
Peter Livingston, Agricultural Economics
Erica Lundquist, Stephanie Ewing and Tim Doane, Land, Air & Water Resources
Miriam Volat and Enrique Herrero, Vegetable Crops
Molly Espley, Agronomy & Range Science
Ben Shouse, Nematology/ Ecology
Heather Podoll and Cecilia Jones, Plant Pathology

Economic Analysis

In general, the relative costs, gross returns, and net returns among the systems were similar to previous years. However, reduced costs and good yields lead to greater profits in all systems in 1997. Most notably, tomato production costs in the low-input system were substantially reduced by substituting one herbicide application for hand hoeing, leading to greater profits.

Total costs for the four farming systems in 1997 ranged from $734 to $806 per acre. The conv-4 system had the lowest costs at $734 per acre. It was followed by low-input system at $739, the conv-2 system at $775, and the organic system at $806 per acre. The cost of planting corn in the three, four-year rotations increased this year because of crow damage which required replanting. The amount of acreage replanted varied from 25 percent in the low-input system to 150 percent in the conv-4 corn system. This drove up the costs of all three systems. Other major sources of cost variation among treatments were the incorporation of the oat/vetch/pea crop in the organic system instead of harvesting it as hay as was done in the low-input system, weed control practices, fertility management, and yield differences in beans.

Potential Benefits

SAFS project research has demonstrated many of the benefits and limitations of low-input and organic farming systems in California's Sacramento Valley. The findings with the most potential for positive benefits lie in the areas of pest management, N fertility and nutrition, and soil structural improvement.

Agronomic and economic evaluations of pest management systems have shown dramatically different potentials for pesticide reduction in the processing tomato and field corn. The findings illustrate that pesticide reductions in tomato, while possible, are economically costly primarily because of the lack of efficient nonchemical weed management tactics. Although pesticide use could be reduced by 50 percent, premium prices are needed to compensate growers for increased pest management costs which may average 50 percent more than conventional pest management costs. By contrast, pesticide use in corn, bean, and safflower grown in a four-year rotation could be reduced by 50 percent or more with little or no reduction in yield.

The performance of the low-input and organic tomato and corn systems has demonstrated that winter legume cover crops can provide 50 percent of needed N and result in improved soil structure. Average low-input corn yields have been nearly 9 percent greater than conv-4 yields over the entire nine years of the project. Management of the low-input tomato system is currently evolving to more closely resemble that of low-input corn.

Farmer Adoption and Direct Impact

The SAFS project receives increased attention each year from farmers, industry, researchers, and the general public. Ideas that were once considered to be impractical or even radical are now gaining in popularity. As consumer demand for organic foods increases more growers are considering the transition to organic farming systems and seek out the SAFS project to get information and advice. Others are simply interested in reducing costs or improving soil quality. Information and experience generated by the SAFS project since 1989 can be incredibly valuable in informing growers of some of the agronomic, economic, and ecological consequences of their many options.

The degree to which California farmers are adopting low-input production methods is difficult to assess. Although there is clear evidence that increasing numbers of growers are using or are planning to use low-input practices in fertility and pest management, statewide material input expenses are increasing at a much greater rate than is total gross farm income. Total material input, fertilizer and lime, and pesticide expenses increased by 40, 35, and 22 percent, respectively, from 1992 to 1995. Moreover, state records indicate that total pesticide use in California continues to increase. Thus, while there are numerous examples of farmers experimenting with or adopting more environmentally-sound practices in California, reduced dependence on purchased material inputs is not widely apparent at the state level. Clearly, there is a continued need for research, education, and extension on agricultural sustainability in California.

Reactions from Farmers and Ranchers

Bruce Rominger, Yolo County farmer, reflecting on the impact of the SAFS project over the nine years of its existence:

"In the first years of the project the question was, 'are these systems [low-input and organic] going to work' and now we take for granted that they do work. Many of the initial problems have been overcome and now the focus has shifted toward refining the systems."

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Annual Results

SW96-016

Tillage Practices for Improving Nitrogen Cycling and Soil Quality

Location:
Salinas Valley, California

Funding Period:
July 1996 –

Grant Award:
$102,000

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Israel Morales, American Farms, Salinas
Bill Tarp and Greg Lazzerini, Triangle Farms, Salinas
Ron Yokota, Tanimura and Antle, Salinas

Objectives

1. Describe soil carbon (C) and nitrogen (N) dynamics immediately after tillage.
2. Examine the effect of organic matter (OM) additions on C and N dynamics after tillage.
3. Identify management options that minimize short-term C and N loss by altering the type, timing or frequency of tillage, both during crop production and during the winter fallow.
4. Analyze the costs and benefits of the new management practices in terms of economic feasibility and agroecosystem health.
5. Demonstrate these tillage options in the context of commercial agricultural practices to show their practical applicability to growers.

Abstract

In the intensive, large-scale vegetable production systems of California, growers typically rely on frequent tillage and add little organic matter (OM) to the soil, so that low levels of soil OM are present. Our goal is to better understand the effects of tillage on soil carbon (C) and nitrogen (N) dynamics, and on risks for disease, insect pests and weeds. We have established long-term studies on growers' fields for comparing responses to reduced tillage methods. In addition, daily responses of soil microbial activity were monitored after tillage in order to understand the disruptive nature of tillage events.

This project is conducted in the Salinas Valley, the nation's largest production area of cool-season vegetables, where N losses to leaching and gaseous emissions are very high. Thus, we focus on alternative practices for tillage and OM management to avoid N loss, yet maintain N availability to crops, while minimizing the potential for pest risks.

After discing and rototillage of two Salinas soils, microbial biomass and activity declined within a few hours, but carbon dioxide emission and production of NO_3^- increased. Thus tillage appears to be a disruptive event with immediate potential for C and N loss. Our cooperators were Triangle Farms and Tanimura and Antle. Less emphasis is now being placed on such short-term studies due to other funding sources (e.g., USDA-NRI, Kearney Foundation). Our focus for the SARE grant is now on long-term, on-farm projects.

A long-term assessment is being conducted on effects of alternative tillage practices on soil properties, vegetable yield, and crop diseases on a large, mainstream farm in the Salinas Valley. Our farmer-cooperator is Israel Morales from American Farms, who has designed tillage practices and equipment for deep tillage on semi-permanent beds for fields under sprinkler/furrow irrigation. His methods for retaining beds consist of five tillage operations totaling 1.5 to 2 hours per acre, and require much less time and fuel than conventional methods that breakdown beds, disk, and re-form beds after every crop. The five tillage operations used in the five-step reduced tillage method are: 1) mow/chop crop residues; 2) minimum-till chisel which simultaneously chisels furrows and disk hills beds; 3) 'Sundance' which disks the surface of the beds and clears the furrows; 4) minimum-till rip which breaks the compacted layer at depth in the beds; and 5) surface roto-till/mulch to smooth the surface and prepare a seedbed. This year, we found that the five-step reduced tillage method can produce less soil compaction than conventional tillage methods.

In April 1998, we established a large multidisciplinary project to investigate the combined effects of tillage and OM additions on various aspects of the vegetable cropping system: yield, soil fertility, soil microbial biomass and activity, plant disease, insect pests, weeds, and economic and fuel costs. Our cooperator is Ron Yokota of Tanimura and Antle, a large and progressive vegetable operation. The project will continue through the year 2000. The study focuses on iceberg lettuce, a main crop in the area. There is considerable interest among lettuce growers about the effects of tillage and OM management on soil fertility and disease.

A major strength of this project is excellent cooperation with growers in on-farm research. In one on-farm study, two years of reduced tillage practices with shallow implements resulted in higher plant disease (corky root and lettuce drop) and lettuce yield than with deeper implements that also retained semi-permanent beds. Another on-farm study began this year to investigate the combined effects of reducing tillage and increasing OM addition. In this first year, yield, diseases (damping off, corky root, downy mildew, and lettuce drop), and leafminers showed little difference. In the high OM treatments, soil NO_3^- was lower during the winter and biomass of one weed species was reduced. Further changes will be monitored in coming years.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW96-019

Sustaining Agriculture and Community: Moving the Farm Improvement Club Program Beyond the Farm Gate

Location:
Montana

Funding Period:
July 1996 –

Grant Award:
$145,425

Project Coordinator:
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Joe Von Stein, Montana Salinity Control Association
Mike Velosky and Mick Jackson, Montana Association of Conservation Districts
James Johannes, Montana State University Extension Service
Jim McCarthy, Montana Department of Fish, Wildlife and Parks
Grant Jackson, Western Triangle Research Center
Barbra Mullin, Montana Department of Agriculture
Wade Crouch, Cascade County Extension

Objectives

1. Improve the support for sustainable agriculture by helping create a collaborative network of all public and private sustainable agriculture programs in Montana.

2. Increase farm and community economic viability by helping farm improvement clubs identify and develop commercial potential for their products.

3. Increase opportunities for reciprocity between farm improvement clubs and their communities in an effort to build social capital.

4. Inform those administering farm improvement club-type programs and the interested public of what works, what doesn't, and what we would change in our own program and why.

Abstract

AERO's farm improvement club program is increasing producers' understanding and adoption of sustainable agriculture farming systems. It is rebuilding economic vitality and a sense of community in rural Montana communities. The farm improvement clubs are providing a vehicle for cooperation within rural communities to solve common agricultural problems.

Our farm improvement club program is a proven model for other similar programs in New Mexico, Nebraska, Washington, Iowa, Massachusetts, Kansas, Michigan, Pennsylvania, North Carolina, Maryland, and Alberta, Canada. The model is flexible, making it useful to people involved in many types of agriculture from all regions as well as to people with a wide range of ages, skills, and interests. The Clubs also provide a format for agriculturists to interact with cooperative extension agents, resource conservationists, and university researchers which is valuable not only for club members but also for the consultants. Several researchers have reported that they have fine-tuned their research projects as a direct result of their contact with AERO club members. Of course, the most significant value of farm improvement clubs is their positive effect on Montana agriculture. Clubs have reformed agriculture by increasing peoples' understanding of soil building, by diversifying crops, by improving the health of range lands and riparian areas through innovative grazing techniques, by introducing alternative weed treatments, by supporting value-added products, by involving Montana's youth (tomorrow's growers and consumers), and by providing general education about the food system.

In 1998, AERO assisted a total of 17 Farm and Ranch Improvement Clubs (FRIC), including five new clubs: Chico Geothermal Greenhouse Club, Boulder Geothermal Greenhouse Club, Chokecherry Syrup Club, Lake Missoula Permaculture Club, Stillwater Noxious Weed Team. The network of farm and ranch clubs provides a valuable source of information for commercial development of innovative crops, approaches to marketing, and production techniques and technologies. Clubs provide essential region and crop-specific information to growers as well as the confidence of first-hand accounts of recent success. They also provide the ingredients of social capital through reciprocal interactions between growers within a region, between growers and agronomy experts, and of course between growers and consumers. Clubs that are particularly visible through newspaper articles and appearances at public forums also increase mutual trust, and consequently social capital, within their communities—particularly when they are dealing with issues of economic, ecological, and human health.

Information dissemination occurs on several levels. Beginning within clubs, information on production, economics, marketing, etc. is central to the existence of the clubs. This same information is often shared with other clubs and with AERO members as well as regional communities through public events and news reports of progress. Finally, innovations are often of interest to university and government agricultural professionals, who then spread the findings even further.

Building partnerships has been integral to the Farm and Ranch Improvement Club program. As a result of this program this year, AERO created a directory of Montana's agricultural products known as Abundant Montana. It was widely distributed with over 3,500 being sent out throughout the state. We also did a targeted mailing to Montana's libraries and extension offices. This project has done a lot to build the identity of Montana-grown products. We plan to reprint the directory and expand upon it over the next two years. This directory has shown itself to be an effective marketing tool for Farm and Ranch Improvement Club members.

Potential Benefits

The Milk Thistle Crop Development Club worked to increase the viability of milk thistle as an alternative crop for Montana farmers. It is used for medicinal uses in treating liver and blood disorders. Though it has been a commercial crop in Montana since 1990, it has the potential to be a much more important crop. The Mission Valley Growers Cooperative is working to increase farm profits through a marketing cooperative and through value-added food processing. They have contracted with two University of Montana business students who are assisting them with writing a business plan for their marketing cooperative.

Farmer Adoption and Direct Impact

In the first year (1997) of their three-year plan to replace "hard" pesticides used to control fruit flies, the Flathead Farm-Orchard Improvement Club identified and hosted an expert in organic control methods. In 1998, Club members adopted various parts of his recommendations according to their own special circumstances. Club members applied about four hundred million nematodes on four test acres of cherry orchard including a non-commercial neighbor's backyard trees.

The Prairie Farm Improvement Club is working to address one of the biggest problems for livestock producers by looking for ways to use summer fallow land to produce winter feed. They are trying different combinations of fallow/feed crops and then sharing their findings with one another and outside the club. One of the club members pastured his cattle on pea "stubble" after harvest for three weeks. Because they were experiencing a drought, the additional three weeks of pasture saved on feed costs.

The Beartooth Management Club came up with a creative approach to evaluating land management monitoring techniques. For their "Land Management Shootout" they evaluated five plots using traditional Range Site and Condition reviews, Land EKG®, Pasture Walk — Monitoring for Solutions, Holistic Management Biological Monitoring, and Ecological Site monitoring. The shootout was part of a public event and was "an eye opener for the Bench Ranch. In fact, because of the shootout, they have completely re-planned their land management affecting the whole ranch." Producers typically view land monitoring as too time consuming, complicated, and indirectly related to profits.

The Chokecherry Syrup Club, which has successfully marketed a locally made pancake mix and chokecherry syrup packaged together, is making plans to expand their line of products. Future plans include a catalog of locally made products.

Reactions from Farmers and Ranchers

"It was the farm club that opened our eyes to what was going on around us! We have met so many interesting people through our field trips and associations with other clubs in the area. Field trips to places like a potato tissue cloning lab, goat dairy farm, wild game hatchery, and a trout farm have shown us how fascinating and diverse agriculture can be. Being involved with the Weed Team and going to the community meetings about herbicides and alternative weed control has taught us more about science and politics than we would have ever learned from a textbook. With our farm club activities keeping us interested and inspired, we now have a HUGE garden, at least a thousand trees and bushes on our property, as well as chickens, ducks, turkeys, and various other animals hanging around." — Vanessa Dowdle, age 17

Future Recommendations or New Hypotheses

As producers experiment with growing new and alternative crops, they are frequently frustrated by a lack of marketing opportunities. Future directions for the Farm and Ranch Improvement Club programs will include a stronger emphasis on marketing. Ideas include forming marketing clubs with marketing advisors, providing business development training to clubs and promoting retail identity of local, Montana-grown food/products.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW96-021

Controlled Grazing on Foothill Rangelands

Location:
Northern California

Funding Period:
July 1996 –

Grant Award:
$40,750

Project Coordinator:
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James Oltjen, Animal Science Department, UC Davis

Cooperators:
Harold Hunt, Rancher, Arcata
Dan Suther, Veterinarian (retired), Redding
George Work, Rancher, San Miguel
Marcus Haney, Rancher, Oakdale

Objectives

1. Demonstrate controlled grazing on foothill range/annual grassland.
2. Demonstrate monitoring procedures to assess range condition and trend and livestock performance.
3. Teach research based controlled grazing practices to livestock producers.
4. Compare effects of controlled grazing to conventional grazing on livestock production and economic performance.

Abstract

This project, Controlled Grazing on Foothill Rangelands, is part of the Sustainable Ranching Research and Education Project. The project consists of a 250 acre watershed at the University of California Sierra Foothill Research & Extension Center in northern California. The site consists of approximately 250 acres of annual rangeland and oak woodland.

In 1996 and 1997 we developed 22 rangeland paddocks using over six miles of two wire electric fences. We laid nearly two miles of water line serving three storage tanks and five permanent watering points. In June 1996 we stocked the project with 27 bred cows culled from the field station herd. We weigh and body condition score cattle monthly. We also collect and test forage and fecal samples monthly. We read permanent transects and monitor photo-points annually.

Our first calves were born in October and November 1996. Most ranchers use fall calving season on California's annual range because it results in heavy calves by May when they wean. Since forage quantity and quality during the calving and breeding period (October to February) is generally poor, ranchers feed hay. We timed breeding in 1997 to shift calving to match the forage cycle. Our first spring calf crop was born in April to May 1998. By calving in April and May, managing cow body condition and using controlled grazing to ration winter feed, we eliminated the need for hay. Our cattle have not been fed any hay since the project began.

Our most important finding thus far is that it is possible, and may be more profitable, to eliminate hay feeding from a year-round, cow/calf operation on California's annual rangeland. However, to eliminate hay feeding, ranches must be restructured so that the cow's production cycle matches the forage cycle.

Cows lactating during our first winter did not receive hay and body condition dropped dramatically. The conception rate would have been extremely poor had we tried to breed cows to calve again in the fall. However, because we had a longer post-partum anestrous period (shifting to spring calving) conception rate was 100 percent. Cows will be preg-checked in early December 1998 to determine conception rates after spring calving. Because they calved in such good body condition and maintained good condition through their summer lactation, we anticipate high conception rates.

In contrast to winter of 1996-97 when the lactating cows lost body condition, in the 1997-98 winter our dry-pregnant cows (bred for spring calving) actually gained condition.

Economic Analysis

Gross margin is a good measure of economic efficiency. Shifting the calving season to match the forage cycle increased the economic return in 1997. The gross margin of project cattle was $174.37/head (35.1

percent return on the beginning inventory value of the herd). Gross margin per acre was $18.83. Gross margin per head for the conventionally managed comparison herd $131.6 (26.6 percent return on beginning inventory value). Gross margin per acre was $16.45. The project realizes additional savings because we do not require labor or equipment to feed hay or facilities to store hay.

Potential Benefits

- Controlled grazing may be a way to carry more animals on a ranch sustainably. With increasing lease costs and competition for grazing land, this may provide an important competitive advantage for ranchers.
- Controlled gazing with spring calving may eliminate the need for hay from year-round livestock operations in California.
- Controlled grazing may control weeds without chemicals.
- Controlled grazing may improve water quality without expensive capital improvements or destocking the range.

Farmer Adoption and Direct Impact

We are challenging producers to question their current practices, but we are stopping short of recommending the management methods used in our study. Our results suggest spring calving and controlled grazing have fantastic potential, but we need to interpret our results cautiously for two reasons. First, 1998 was the best forage year we can remember. Some of our results may have been due to ideal forage growing conditions. Second, 1997-98 was a transition year. Cows had a long post-partum anestrous period in 1997 resulting in higher than normal body condition at calving. Body condition at calving is the single biggest factor affecting conception rates. Therefore, this year's conception rate may be artificially high. We need at least two more years of data before we can be confident our results are due to our management changes.

Reactions from Farmers and Ranchers

Reactions from ranchers attending the Grazing Academy:

"In attending these type of workshops I always learn something new and even when it's a review for me—this academy was more than I expected. Great info and presentations."

"I was able to ask tough questions and get answers to them, experience a hands-on experience, learn more on animal behavior and handling."

"Probably the best extension-sponsored program I have attended."

Producer Involvement

We have a steering committee of four producers who have used, or are contemplating the use of the practices we are studying. Since the start of the project hundreds of producers have participated in educational programs at the project site. In 1998, 53 producers and 25 agency personnel attended workshops at the project site. Approximately 1,500 ranchers learned of our work by presentations we gave at various meetings.

Future Recommendations or New Hypotheses

We are confident that spring calving will increase profit and increase the beneficial effects of controlled grazing. As our next step we need to clearly define "spring." We intend to conduct an experiment to compare two spring calving scenarios. One set of cows will calve as soon as rapid grass growth begins (late February-early March). The other group of cows will calve later so that the cows can gain condition prior to calving (April-May calving).

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW96-027

The Production of New, Existing, and Native Crops Under Conventional and Organic Production Practices in Costilla, New Mexico, Garcia, Colorado, and Taos Pueblo

Location:
Southern Colorado and Northern New Mexico

Funding Period:
July 1996 –

Grant Award:
$100,000

Project Coordinator:
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Major Participants:
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Taos Pueblo Agriculture Department
New Mexico Department of Agriculture
New Mexico State University Cooperative Extension Service (NMSU CES)
Rio Costilla Cooperative Livestock Association
Sangre de Cristo Growers Association
New Mexico Organic Commodities Commission
Questa Producers Association

Cooperators:
Reynaldo Torres, NMSU CES
Del Jimenez, Rural Agricultural Improvement and Public Affairs Project, NMSU CES
Terri Badhand and Patti Martinson, Taos County Economic Development Corporation
Lonnie Roybal, Sangre de Cristo Growers' Association
Gilbert Suazo, Taos Pueblo Agriculture

(continued)

Objectives

1. Demonstrate the production of new, existing, and native crops under conventional and organic/low input production practices in Costilla, New Mexico, Garcia, Colorado, and Taos Pueblo and perform an economic analysis on the above.

Abstract

The setting for this project is Taos county in northern New Mexico and Costilla county in southern Colorado and includes the villages of Costilla, New Mexico, Garcia, Colorado, Questa, New Mexico, and Taos Pueblo. These villages have one of the highest unemployment rates in the two states and a high poverty rate. Employment opportunities are limited to seasonal work at local ski resorts or other low paying jobs. Residents do have land and water resources and limited equipment. Farm sizes range from one to 40 acres, with the average land holding being about ten acres per farmer. Climate is a major factor to the region; the growing season can be as short as 80 days. Water supplies for irrigation can be highly variable, ranging from nothing one year to a surplus the next. The infrastructure necessary to practice irrigated agriculture has deteriorated through lack of maintenance on many farms.

In addition to these problems, there seems to be an entire generation of farmers that did not work the land. Most of the residents who farmed these lands before WWII left the area to seek employment in major cities such as Albuquerque or Denver. Their children, now grown and mostly in their mid to late 40s, are the clientele for this project. They have a desire and commitment to staying in their communities, but often lack the "hands on" farming experience.

In spite of these limitations, there is a strong sense of community in each village, a willingness to cooperate with one another within communities and between communities, and a strong commitment to remaining on the land. Alternatives to farming are few. In most cases, it is either farm or leave.

Project personnel sought funds to maintain and increase the momentum gained in a 1995 project funded by the New Mexico Department of Agriculture (NMDA) and to continue to develop localized sustainable agriculture in northern New Mexico and southern Colorado and at Taos Pueblo. The project sought to increase the acreage planted to crops, and continue to plant demonstration plots of new and innovative crops. The project also sought to develop a small greenhouse operation in Costilla, New Mexico.

To date, much has been accomplished. Grain acreage has grown from 150 acres planted in Costilla, New Mexico and Garcia, Colorado in 1995 to over 300 acres planted in 1998 in these villages as well as at Taos Pueblo. Demonstration plots of cool season vegetables and a wide variety of flowers were grown at Costilla, Questa, Taos, and at Taos Pueblo. The transplants for this project were produced in the greenhouse facility in Costilla. A market for all wheat produced in the project was established in Santa Fe and growers received $7.00 per bushel for this year's organically produced crop. In addition, due to the efforts of the growers, funds have been procured to establish a flour mill in Costilla in the coming year.

An additional project that began in 1997 (not an initial focus of this particular SARE project), was the continued development in 1998 of a community garden at the Taos County Economic Development Corporation's headquarters that enabled several young women on welfare or in the Women, Infants, and Children program to plant, produce, and market vegetables from approximately one acre, and earn some supplemental agricultural income.

All growers became organically certified in August 1997 and again in 1998, after undergoing the New Mexico organic certification process. Certification in itself ensures continued use and development of

Cynthia Rael-Vigil, Artesenos de Questa
Juan Montes, Regeneracion del Norte
Julia Mullen, Northern New Mexico Legal Services
The McCune Charitable Foundation
Harold Anderson, Anderson Grain Storage
Jose and Kathryn Cordova, Valencia Flour Mill
Willem Malten, Cloud Cliff Bakery
Bernie Torres, Torres Transportation

organic agricultural practices such as developing and maintaining soil fertility and practicing crop rotation. By certifying, growers committed themselves to this program.

An important development for the project occurred when a certified organic flour mill was located in central New Mexico, and a high end Santa Fe area bakery committed to buying all wheat produced from the project and to develop a completely new product line.

Potential Benefits

In a social sense and within the context of sustainability, this project has had the immeasurable impact of keeping families on farms, within their communities. It has seen individuals coming together to work as a team during planting and harvest in a cooperative spirit.

Educational gains were made by all participants, including the public as well as the private sector, in sustainable agricultural practices, in developing mechanisms for coordination and cooperation, and in bringing a crop to the marketplace. The impacts this initial year will have on participants in the program are immeasurable, but highly significant. Furthermore, the lessons learned this past year (and it was a learning year) will lead to definite improvement next year and in the years to come.

This project has had several positive impacts. First, land not farmed for an entire generation has been brought back into production. While most of the nation is losing farms, communities in northern New Mexico and southern Colorado actually gained a few in 1997 and 1998. More than anything else, it has allowed families and communities in an extremely depressed region of the United States, an opportunity to remain where they want to be, and to raise their children in a rural setting.

In addition, many of these farms have brought in income for the first time in a generation, and did so in an environmentally friendly fashion, without the use of chemicals such as pesticides and herbicides.

Farmer Adoption and Direct Impact

This project has had direct and positive impacts on over 30 farmers and their families. An additional nine people participated in the greenhouse project. It has enabled many who had no alternative in 1996 but to seek income outside agriculture an income from agriculture in 1997 and 1998. It has also positively benefited young women on welfare, an organically certified flour mill, one large bakery in Santa Fe, and the SARE program itself.

Farmers have been involved in the planning of this project since 1993, the time of our first meeting. The most important development in this project has been that agriculture as a livelihood has been reintroduced to northern New Mexico and southern Colorado, a fundamental change in practice.

Future Recommendations or New Hypotheses

There are no new discoveries or hypotheses being derived from this particular project. However, one valuable lesson has been learned. People working together, given adequate resources, can make a positive difference in their communities. An additional note along these lines is that the project also has proved that a wide variety of state, local, and federal agencies can work cooperatively with private industry to stimulate economic development in rural areas.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW96-029

Potential of a Corn/Annual Medic Intercropping System for Weed Control, Reduced Soil Erosion and Improved Forage Production

Location:
Wyoming

Funding Period:
July 1996 –

Grant Award:
$95,100

Project Coordinator:
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Cooperators:
Jack Cecil, UW Research and Extension Center, Torrington

Objectives

1. Evaluation of the most appropriate pasture legume species for effective weed suppression when undersown in irrigated corn.

2. Determine the appropriate seeding rate and sowing time of the selected annual medic to maximize weed suppression.

3. Investigate the regenerative capabilities of the selected annual medic and its potential to compete with weeds in a continuous-corn cropping system.

4. Establish the potential for improving livestock production from grazing the corn stubble/legume pasture mix in autumn following corn harvest.

Abstract

In year one, eight annual legume species were evaluated for intercropping potential with corn at one seeding rate. Based on the finding the year one trial, George black (*Medicago lupulina L.*) and Orion (*Medicago sphacrocarpus L.*) medics were selected for further study. The objectives of year two research were to (i) evaluate the effects of planting date and seeding rate of George black and Orion medics on grain and forage yield of corn under irrigated conditions, (ii) determine the effect of planting date and seeding rate on George black and Orion forage production when intercropped with grain and silage corn under irrigated conditions. Replicated field experiments were conducted at the University of Wyoming Research and Extension Center at Torrington.

The results from these experiments (year two findings) provided further evidence that a corn-medic intercropping system may be a viable option for producers in southeastern Wyoming. The system worked in both silage and grain corn production. A silage production system would be more suitable if the main objective of the producer is to get good quality fall grazing for livestock. If grain corn production is the goal of the farmer then George black medic is the best medic species to incorporate into the intercropping system. George black allows for increased forage production while having the least effect on corn yields. To allow for optimal corn and medic production, George black medic should be planted at a seeding rate of 344 PL seed/m^2 at the time of corn planting, and bentazon should be added to the herbicide tank mixture with imazethapyr, pendimethalin, and NIS.

Presentations were made at two field days. Conference presentations include the Western Society Weed Science, the Western Crop Science Society and at the Annual Medic Workshop of North American Alfalfa Improvement Conference. A graduate student thesis was completed.

Potential Benefits

Medic/corn intercropping has the greatest potential to impact sprinkler irrigated corn. It is estimated that 60 percent of the corn acreage in Wyoming is under sprinkler irrigation. In Wyoming alone, this practice could provide additional ground cover, improve the pasture resource, and improve soil quality on over 21,500 ha.

Farmer Adoption and Direct Impact

It is still too early to assess the farmer adoption. However, based on the interest expressed by producers at field days there is a strong likelihood that acreages in southeastern Wyoming may be seeded to the legume/corn system in the 1999.

Future Recommendations or New Hypotheses

Management systems practices on a large field bases with livestock that exploit the competitive abilities of medic in combination with other weed control measures are required.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW96-032

Identification of Management Practices and Cultivars for Organic Hard-Winter Wheat Production

Location:
Utah

Funding Period:
July 1996 –

Grant Award:
$93,911

Project Coordinator:
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Cooperators:
Robert Newhall, USU Extension
Richard Grover, Farmer, Box Elder County
Central Mills
Gary Crowley, Farmer, San Juan County

Objectives

1. Identify existing hard winter cultivars that perform best in yield, test weight, competitive ability, and disease and insect resistance or tolerance under organic conditions.

2. Determine effectiveness and value of compost amendments and green manure in increasing yield and grain quality.

3. Determine the rate of mineralization and estimate number of years of benefit provided by compost addition.

4. Analyze the economic break even points through enterprise budgeting for organic production with and without compost addition.

5. Determine end use quality of current cultivars and elite lines by mixograph, NIR and miller and baker evaluation.

Abstract

Dairy manure compost was applied to dryland organic wheat production fields in Box Elder county, Utah. The production field is in crop-fallow rotation so two sites (alternate years) were treated in the first two years. The compost was applied at 0 (control) and 112 Mg ha^{-1} (50 ton acre^{-1}) in a split-plot arrangement with compost addition as whole plots with three reps and ten germplasm entries as split plots within the whole plots. The two years of data were combined in a single analysis that was a split-split plot design. Years and locations were confounded due to the nature of the crop-fallow rotation. Additionally, compost treatments of 0, 22.4, 56, and 168 Mg ha^{-1} were examined as a randomized complete block design for the single cultivar Hansel (with 0 and 112 Mg ha^{-1} compost addition data for Hansel coming from the immediately adjacent split-plot experiment).

Yield trials and soil testing in the three years since the project has begun has shown that compost addition results in higher grain yields for winter wheat. The yield effect is not the same for all cultivars and there is a significant genotype by environment interaction. The highest yielding wheat cultivar under no compost addition to date is Bonneville, a high quality bread wheat released within the past three years by the University of Idaho. At a compost application rate of 112 Mg ha^{-1}, the top yielding cultivar to date is a breeding line, UT1944-158, that has recently been increased in foundation seed and has been replanted in a foundation field on the land of one of our SARE collaborators. Protein levels in the grain also increased as a result of the compost addition. The linear correlation for protein level was 0.70. Improvements in mixograph quality were also observed.

Compost has been effective at increasing grain yield in the initial years of this study. Additional years of data will need to be accumulated to determine if this is a reliable conclusion. There has been a highly significant (Pr>F=0.0001) effect of cultivar and compost addition rate, and the cultivar compost rate interaction was also highly significant. The finding that the cultivars and breeding lines differed in yield potential was not unexpected, the entries were selected as a fairly divergent population.

Grain quality has also been improved through the addition of compost in the first two years of study. Mixographs have been run on the two sets of data and show increases in mix time dough strength and dough tolerance due to compost addition. This is also observed in NIR protein determinations. The

average protein level of all of the cultivars for all site years analyzed under the control conditions was 13.4 percent while the average protein level with addition of 112 Mg ha^{-1} of compost was 13.6 percent. This difference was significant at a=0.05.

Green manure studies have been disappointing. Two separate experiments designed to examine various legume species on both fall and spring planting have resulted in unusable plots due to rapid weed establishment and competition.

Potential Benefits

Reduction of chemical fertilizer applications can save producers large amounts of money. However, organic production can only continue so long as it is profitable. Currently, thousands of acres of dryland organic wheat are being grown in Utah. Since this project began, one of our producer collaborators has changed their rotation to take advantage of an emerging market for organic safflower. We are adapting to their change in practice by changing our experimental design to take advantage of new potential information about a crop that was not in our original study as well as continuing to gain valuable new data on wheat. The change that we are implementing in our experimental design is made possible, in part, to emerging GPS/GIS technologies that will allow us to "tag" areas of the field for our compost additions. The farmer can work the field and plant their new wheat-safflower-fallow rotation using their normal production equipment instead of our specialized research plot equipment. This will allow us to take yield and quality samples from within the plots as well soil samples over the long term without disrupting the normal cultural practices of the grower.

Future Recommendations or New Hypotheses

Originally, we expected to observe yield and quality improvements from additions of 112 Mg ha^{-1}. Our first year data indicated a larger effect at lower rates than we had anticipated. As a result we have changed our emphasis to lower rates of application. The goal is to make application as economical as possible while still retaining yield and quality benefits.

Producer Involvement

There have been no field days or conferences specific to this research since it is still in early stages. However, the research has been mentioned at extension field days (two in 1998 with average attendance of 90) and we have met with individual growers six times in 1998 as well as answering email and telephone requests about the research.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-010

Management, Impact and Economics of Beef Cattle Grazing in Mountain Riparian Ecosystems

Location:
Oregon

Funding Period:
December 1997 –

Grant Award:
$105,400

Project Coordinator:
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Neil R. Rimbey, Dept. of Ag. Econ. and Rural Sociology, University of Idaho, Caldwell, ID
John A. Tanaka, Dept. of Ag. and Resource Economics, OSU, Corvallis, OR

Cooperators:
Blue Mountains Natural Resources Institute, USDA, Forest Service, La Grande, OR
Oregon Cattle Association, Cove, OR

Objectives

1. Integrate cattle grazing methods and physical factors of mountain riparian ecosystems into a ranching model that demonstrates sustainable natural resource use.
2. Conduct range and riparian monitoring and bioassessments of mountain riparian ecosystems to determine the impacts of livestock grazing.
3. Determine economic implications of alternative grazing management to improve the ecological condition of riparian areas.

Abstract

The first year of a two-year replicated study investigating the effects of cattle grazing in a mountain meadow on the riparian ecosystem was completed. Cattle grazing and "riparian health" issues are currently at the forefront of public and rancher concerns in the Northwest. A ballot initiative in Oregon proposed that cattle be fenced out of all riparian areas located in critical habitat stream segments. In southwest Idaho, the current Bureau of Land Management (BLM) Resource Management Plan proposes a 35 percent reduction in animal unit months (AUM) that would eliminate cattle grazing in those allotments after July 15 to reduce the impacts of cattle grazing on riparian areas. Research findings and the demonstrative value of this study are timely and extremely important to ranchers, as well as recreationalists, environmentalists and agency personnel. The critical need for this type of project is evidenced by the number of stakeholders that have become cooperators.

Site construction, forage evaluation, riparian, transitional zone and upland bio-assessment, water quality analysis, cattle performance and behavior, site mapping, economic analyses, and field days have been completed. The treatments consisted of grazing with turnout of cattle into the riparian pastures occurring on two separate dates (early turnout July 9, 1998, late turnout August 17, 1998). Each treatment was replicated three times for a total of nine pastures that provided visual *across-fence* comparisons (three pastures each of early turnout, late turnout and no cattle grazing control). The project was designed to evaluate the economic impacts of cattle grazing management on ranches in the Pacific Northwest.

Cattle behavior and distribution, cow/calf performance, forage utilization, riparian bio- assessments and greenline data were recorded and are in the processing phase. During each grazing period, eight days of intensive observations were conducted to continuously monitor cattle distribution cycles and foraging behavior. This was attained through hourly field recordings on each animal's location within each pasture and was accompanied by data gathered from continual feeding recorders (vibracorders) worn by the animals. In order to estimate any changes in cattle production, each animal was weighed and body condition scored before and after each grazing period. With these data and collected forage quality samples, we can observe the linkages between changing production levels, cattle distribution, and seasonal forage availability.

Initial observations indicate that cattle grazing occurring at the separate turnout dates effected the riparian ecosystems differently. Wet and soft riparian soil structures appeared more susceptible to cattle grazing during the early turnout period, however cattle appeared to spend less time in the actual riparian area then the late turnout period. Again this is preliminary and all conclusions will be based on two years data and statistical analyses.

(continued)

Cathrine Creek Working Group, OCA WEST Program, Union, OR
Grand Ronde Model Watershed, La Grande, OR
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Idaho Cattle Association, Boise, ID
Idaho Fish and Game, SW Region, Nampa, ID
Idaho Rangeland Resource Commission, Boise, ID
Adams County Coop. Extension System, Council, ID
Washington County Coop. Extension System, Weiser, ID

Dissemination of information through field days, popular press articles and stakeholder meetings has been ongoing and requests for summary information are numerous. This project has provided an excellent basis for creating an expanding level of public interest, educational platforms, and producer involvement.

Potential Benefits

The project has generated wide enthusiasm among numerous clientele groups that have concerns over cattle grazing in riparian areas. The money provided by SARE/ACE has led to other funding sources and a commitment by the Universities in Oregon and Idaho to continue this effort. A "snowball" effect has occurred, with commodity groups and individuals becoming involved after they recognized the benefits of this cooperative project. With new stakeholder groups participating, the pathways for disseminating information from this study have increased.

Farmer Adoption and Direct Impact

Before management practices that affect livestock production and environmental sustainability are incorporated into ranch systems, the economic analysis can now be assessed to determine feasibility. As additional factors are incorporated into the economic and decision-making model this project will make greater impact and contributions to the livestock industry and the other resource users involved. Extension programs are in place to demonstrate the results of the project and requests for detailed information from the project are numerous. Comments from the clientele groups indicate that multi-disciplinary projects like this are critical to continued wise use of our natural resources.

Requests for this type of information indicate that ranchers as well as agency personnel are extremely interested in incorporating results from this study into their resource management plans. Producers have indicated that they will begin to incorporate information from this project into their grazing management practices. Other ranchers have stated they feel justification for practices that they have already implemented. Funding is available for watershed programs on private and public lands and this information creates the framework to model where improvements will be beneficial and cost effective. Those ranchers with water systems already in place are using this information to validate their investments.

Reactions from Farmers and Ranchers

Ranchers have indicated that this is the type of project we should have been doing all along. They appreciate the group effort and rancher involvement. The combination of research and extension working together with various interest groups will avoid problems when it comes time to incorporate results into ranch management plans.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region
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Annual Results

SW97-011

Sustainable Crop Production Practices with Mixed Leguminous and Non-Leguminous Cover Crops

Location:
Washington

Funding Period:
July 1997 –

Grant Award:
$118,000

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Debra Inglis, Asst. Plant Pathologist
Richard Carkner, Extension Agricultural Economist
Van Bobbitt, Master Gardener/ Urban Horticulture Coordinator

Cooperators:
Larry Willis, Grower, Montesano
Dave Fenn, Grower, Curtis

Objectives

1. Determine the biological and environmental impact of hairy vetch mixed with various types of non-leguminous winter cover crops that are or are not susceptible to winter kill.

2. Perform economic analyses of the production systems that utilize mixed leguminous and non-leguminous cover crops.

3. Involve growers in on-farm research and develop programs to educate other growers, Master Gardeners, and interested citizens in the value of mixed cover cropping systems to facilitate their adoption.

Abstract

This study is on winter cover cropping systems consisting of hairy vetch mixed with various non-leguminous cover crops that include cereal rye, annual ryegrass, spring oat, and triticale that are or are not susceptible to winter kill. The goal is to determine which mixture of leguminous and non-leguminous species is most effective in reducing nitrate leaching during the winter high rainfall period and increasing soil nitrogen (N) availability during the growing season to enhance crop productivity. Economic analysis will determine the costs and estimated benefits from the cover cropping system and the potential barriers that growers face in utilizing the system.

The results from the first year of this study are promising. Hairy vetch mixed with rye or annual ryegrass reduced the residual soil nitrate N after fall harvest and nitrate N leaching during the high rainfall period in the winter in western Washington. The incorporation of mixed leguminous and non-leguminous cover crop residues in the spring significantly increased pre-sidedressing soil nitrate N levels, reduced the N fertilizer requirement for optimum corn yields. The yields of marketable cucumber were also increased by the residues even though the increases in yields were not significant due to the high availability of indigenous soil N.

The growth of hairy vetch accelerated early in the spring and added 50 to 90 kg N ha^{-1} to the above ground residue in a Sultan silt loam soil. The N contribution from the hairy vetch was increased to 160 kg N ha^{-1} in a Puget silt loam that contained a high concentration of available N.

Cover crop residues had variable effects on soil N availability and corn yields. The pre-sidedressing soil nitrate N concentrations, which averaged about 5.6 ppm for the control soil, were essentially unaffected by the non-leguminous cover crop residues, but increased about three times to an average of 17.8 ppm for the residues containing hairy vetch. The increase in soil N availability was reflected in the increased corn yields. Application of 66 kg N ha^{-1} of N fertilizer increased the corn yield from 5.3 to 11.2 M T ha^{-1} on a dry weight basis for the control without cover crop treatment and yields were increased to 18 M T ha^{-1} for the rye/vetch and oat/vetch and 20.5 m T ha^{-1} for the triticale/vetch with the same rate of N fertilizer application. The N fertilizer equivalence of the mixed cover crop residues, estimated based on the response of corn yield to N fertilizer, was at least about 120 kg N ha^{-1} for the oat/vetch, rye/vetch, triticale/vetch, and vetch alone.

Another important feature of the mixed cover crop system was that hairy vetch was capable of reducing pea cyst nematode populations, thereby increasing pea yields of a field severely infested with the nematode. Evidence showed that hairy vetch roots trapped nemas from soil in the fall or by soil-incorporated residues, which delayed hatching and infestation of pea in the spring.

The fall cover crops have been seeded for the 1998-99 season in farm locations in western Washington, which included two on-station research and two on-farm demonstrations. The effects of hairy vetch and cereal rye, spring oat, triticale, and annual ryegrass seeded individually or in combination with hairy vetch on nitrate leaching during the winter and yields and N uptake of succeeding corn, cucumber, and potato crops. Also, to be further investigated is the effect of mixed cover crops on pea cyst nematodes.

Demonstration plots established on farms and on a Master Gardener's demonstration site enabled growers and Master Gardeners to see first-hand the mixed leguminous and non-leguminous cover crop system. Field days were held and a poster was presented also to allow more growers and interested citizens to familiarize themselves with the potential of the cover cropping system to benefit the environmental health and crop productivity.

Potential Benefits

Improving soil productivity and water quality is an integral part of sustainable agriculture and is the goal of this research. The first-year research provided data to support that the goal is attainable with the mixed leguminous and non-leguminous cover cropping system. The mixed leguminous and non-leguminous cover cropping system reduced nitrate leaching during the winter high rainfall period and increased N availability and crop yields. It reduced the N fertilizer requirement by at least 120 kg N ha^{-1} for the mixed leguminous and non-leguminous cover crop systems.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-012

No-till Forage Establishment to Improve Soil and Water Conservation and Reduce Associated Production Risks

Location:
Alaska

Funding Period:
July 1997 –

Grant Award:
$100,000

Project Coordinator:
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Craig and Vicki Trytten, Producers, Wasilla
Peter Scorup, Producer, Palmer
Paul Rumley, Producer, Soldotna
Henry Gettinger, Producer, Fairbanks
Scott Schultz, Produer, Schultz Farms, Inc., Delta Junction
Mark Kinney, NRCS, Homer Field Office
Phil Naegele, NRCS, Delta Junction Field Office
Herb Cook, NRCS, Kenai Field Office

(continued)

Objectives

1. Evaluate the efficacy of no-till planting for establishing timothy and smooth bromegrass in Alaska (including seed and fertilizer rates).

2. Evaluate promising annual crops for feed production and as nurse crops during grass establishment in no-till and conventional planting systems.

3. Determine the effectiveness of no-till stand renovation of thinning grass stands.

Abstract

This report summarizes initial-year results from the study designed to assess the effectiveness of no-till forage establishment on soil and water conservation and to reduce associated production risks. The project is divided into three objectives: 1. Evaluate efficacy of no-till planting of timothy and bromegrass; 2. Assess annual nurse crop productivity in association with no-till establishment; and 3. Determine effectiveness of no-till renovation of existing thinning grass stands.

Six locations on farmer fields, two in Interior (Fairbanks and Delta Junction) and four in Southcentral Alaska (Palmer, Point MacKenzie, Mile 78 Sterling Hwy. and Homer), were selected for trials designed to assess the objectives above. Due to drought conditions in Interior Alaska, forage establishment was minimal so no yield data were collected. In southcentral Alaska, (Objective 1) Manchar bromegrass was planted (seeding rate of 22.6 lbs PLS per acre) at Palmer. The other three sites received Engmo timothy at a seeding rate of 9.0 lbs PLS per acre. The nitrogen rates used were 0, 21.4, 43.6, and 67.3 lbs N per acre (as ammonium nitrate). Positive response to nitrogen was apparent with no-till and conventional-till seedings the initial seeding year. No-till yields were greater than tilled yields regardless of nitrogen application rate. These plots will be sampled again in 1999 and 2000 to assess long-term interactions.

Companion crops (Toral oats, Gulf Westerwold ryegrass, and Dwarf Essex rape) were planted with Engmo timothy (plus 43.6 lbs N per acre) to assess in initial year seeding under conventional-tilled (Point MacKenzie) and no-till conditions (Homer). As expected, companion crop yields were considerably greater under tilled vs. no-till conditions. Toral oats resulted in the highest yields when seeded with Engmo timothy at both locations, 3861 and 358 lbs dry matter per acre in the tilled vs. no-till, respectively.

A no-till seeding rate study using Engmo timothy and Altaswede red clover was planted into an existing bluejoint stand at 0.5x, 1x, and 2x the normal seeding rate, 9 lbs PLS per acre and 13.6 lbs PLS per acre respectively. Nitrogen was applied at 43.6 lbs N per acre (as ammonium nitrate) to the timothy, with powdered Rhizobum added to the clover. Grasss biomass production was not improved with addition of timothy, when compared to the check, in the seeding year. Clover establishment was slow, though stand establishment was very successful. Grass yield in the no-till clover was also suppressed due to the lack of nitrogen (Rhizobium only).

Southcentral Alaska SARE plot yield data, precipitation, air and soil temperature data were mailed to all Southcentral Alaska cooperators in October, 1998.

Potential Benefits

The combination of first-year plot establishment and severe drought at the Interior Alaska locations produced less than optimum results for assessing impacts. However, in Southcentral trials, early indications point to benefits of no-till and probable interactions among tillage, nitrogen rate, and location. Potential

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Calvin Steele, NRCS, Wasilla Field Office
Tommy Stephens, Homer Farm Services Administration, Homer
Tom Jahns, Alaska Coop. Ext., Soldotna
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benefits would appear to be real and should be measurable in subsequent years of the study. The severe conditions encountered in the Interior and to a lesser extent at Point MacKenzie, offer further justification of the need for this research for conservation of soil and water resources.

Future Recommendations or Hypotheses

The environmental conditions which occurred in the first year of the study, while perhaps more severe than the norm, do impact producers from an economic point of view and also subject landscapes to wind and water erosion. The weather conditions encountered offer support to the original justification of the research needs and the original objectives remain sound.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-021

Reducing Insecticide Use on Celery Through Low-Input Pest Management Strategies

Location:
Ventura County, California

Funding Period:
July 1997 –

Grant Award:
$100,000

Project Coordinator:
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Robert Gray, DUDA California, Gene Jackson Farms, Salinas

Objectives

1. To generate a partial budget economic analysis comparing the monetary returns (gross costs, net gain/profit) accruing from the use of current conventional insecticide practices and the low-input program on a standard commercial variety of celery.

2. To estimate the potential for air pollution from solvent emissions from insecticide applications.

3. To determine if implementation of the low input program will impact worker and consumer safety through induction of carcinogenic linear furanocoumarins.

4. To determine environmental health of agroecosystems subjected to the conventional and low input programs by determining the diversity and abundance of selected arthropods present.

5. To communicate information to the celery industry and the local communities via field days at the research sites, and via the California Celery Research Advisory Board and presentations sponsored by the University of California Extension Service.

Abstract

We proposed to implement a low-pesticide-input integrated pest management (low-input IPM) system for celery, and compare its performance with conventional high-pesticide-input management systems. This project directly relates to the SARE program's goals of making agriculture economically viable, environmentally sound, and socially viable. Because of low damage thresholds, celery is among the most intensively managed vegetable crops and therefore is a model system for development of low-input IPM programs. Successful development of low-input IPM programs in such an intensively managed crop will facilitate the acceptance of similar programs for other vegetable crops.

The first year of this two-year project was completed on schedule, as described in the original proposal. This study has been conducted on a commercial scale in collaboration with a celery producer, in Ventura County. The celery was transplanted August 27, 1997, and was harvested on December 26 and 27, 1997.

The low-input IPM program relied on biological control agents, and environmentally-safe biorational insecticides applied only "as needed" in a rotational strategy to delay pesticide resistance. The need for insecticide applications in the low-input IPM program was determined from weekly insect samples. Overall, the low-input insect management program used one-third fewer insecticides than the grower standard did. Although the low-input program used significantly fewer insecticides than the grower standard, there was no significant difference in yield or net profit between the treatments. The grower standard practice had an average yield of 2,748 marketable cartons per hectare (1,112 cartons per acre). The low-input IPM program yielded an average of 2,751 marketable cartons per hectare (1,113 cartons per acre). Based on Free on Board (F.O.B.) market prices at the time of harvest, the net profit for the grower standard was $8,130 per hectare ($3,290 per acre), and the net profit for the low-input IPM program was $8,052 per hectare ($3,258 per acre).

In addition to the favorable economic results, the low-input IPM program has benefits for the environment. The insecticides selected for use in the low-input IPM program are formulated without volatile solvents. Therefore this low-input approach would not contribute substantially to air pollution from volatile emissions.

In the first year of this project we have demonstrated that further reductions in pesticide use can be made in the production of high value, low damage threshold vegetable crops such as celery. This reduction in pesticide use can be made without sacrificing yield, quality or net profit. The progressive insect pest management policy of the grower made this validation test of the low-input IPM program conservative. Hence, many growers could show greater economic benefits from adoption of such low-input programs. Additional progress in successfully reducing pesticide use could be made by developing similar low-input programs for the control of fungal pathogens.

Results for the first year of this two year study have been presented at meetings and in publications accessible to the vegetable producer industry. Presentations have been made at the "Celery IPM Innovator Workshop" that was held on November 6, 1997, in Ventura, and was cosponsored by the California Department of Pesticide Regulation, the California Celery Research Advisory Board and the University of California. The results have also been presented to the California Celery Research Advisory Board and other industry related meetings. The first year results have also been presented at the Annual Meeting of the Pacific Branch of the Entomological Society of America. Articles describing the project have been published in Vegetable and Agribusiness Fieldman. In addition, a manuscript has been submitted to Agriculture Ecosystems & Environment, and another manuscript for California Agriculture is in preparation.

Economic Analysis

For the economic analyses, all non-pesticide costs were derived from industrywide standards (see Trumble, J. T. et al. 1997, J. Econ. Entomol. 90: 139-146). Harvest and marketing costs were also determined in this manner. All pesticide costs (materials and labor) were derived from costs supplied by commercial application firms for treating large acreages of celery. Market prices used for analyses are the free on board (F.O.B.) shipping point prices for the South District of California on the date nearest harvest (USDA Market News Service).

There were no statistically significant differences in the yield or net profit per hectare for the two insect management programs. The grower standard practice had an average yield of 2,748 marketable cartons per hectare (1,112 cartons per acre). The low-input IPM program yielded an average of 2,751 marketable cartons per hectare (1,113 cartons per acre). Based on Free on Board (F.O.B.) market prices at the time of harvest, the net profit for the grower standard was $8,130 per hectare ($3,290 per acre), and the net profit for the low-input IPM program was $8,052 per hectare ($3,258 per acre).

However, the low-input program had one fewer insecticide applications (six versus seven) than the grower standard program. Furthermore because of the system, one application for the grower standard was necessarily applied to the low-input treatment plots, and one application for aphid control was outside of the scope of the low-input program. Overall the low-input program used one third fewer insecticides than the grower standard program with no significant impact on net profit. This reduction in insecticide use resulted in a savings of $208.70 per hectare in insecticide costs.

Potential Benefits

In the first year of this project we have demonstrated that such a low-input IPM program is economically viable. Our results indicate that through adequate sampling to determine the appropriate need for pesticide applications, further significant reductions in pesticide use can be made by the vegetable industry. Additional progress in successfully reducing pesticide use could be made by developing similar low-input programs for the control of fungal pathogens. We would encourage the development of monitoring programs similar to the one for Septoria late blight for other fungal pathogens. Refinement of such low-input programs for insect and fungal pests will produce successful, comprehensive intelligent plant management programs.

The demonstration of clear economic benefits of such low-input IPM strategies to producers is the most effective means to accelerate the adoption of such programs and create a demand for development of additional low-input IPM for other agroecosystems. Therefore, accurate economic information on the benefits of proposed IPM strategies is needed by producers. Creation of partial budgets using accurate economic information provided by growers can generate persuasive data on net profits resulting from specific control strategies. Thus, implementation can occur rapidly once the barrier of "perceived risks" is eliminated.

Farmer Adoption and Direct Impact

Based on the previous year's results, the grower plans to rely on the same materials used in the low-input IPM program. This strategy reflects a significant change that we expect will be adopted by other growers. By collaborating with growers, the benefits of low-input IPM practices can be effectively demonstrated.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-025

Sustainable Culture of the Edible Red Seaweed *Gracilaria parvispora* Abbott in Traditional Hawaiian Fishponds

Location:
University of Arizona, Tucson, and Molokai, Hawaii

Funding Period:
July 1997 –

Grant Award:
$95,201

Project Coordinator:
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Cooperator:
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Objectives

The project goal is to eliminate roadblocks to ogo production, so that production reaches 500 to 1,000 kg/week with 20 to 40 community participants by project end. Specific objectives are:

1. Establish methods to break dormancy of sporelings.

2. Establish methods for cage culture.

3. Design and test seaweed cleaning machine.

4. Disseminate information.

Abstract

We have introduced a community-based form of ogo culture on Molokai. The working partner operates a hatchery which distributes spore-coated rocks to potential growers. They plant patches of ogo on Molokai's extensive south reef, which is public domain. They harvest their patches periodically and sell their ogo to Ke Kua'aina, which multiplies the harvest three to five fold in floating cages, then cleans and markets the ogo in Honolulu.

Research has shown that ammonia is the controlling factor for growth of ogo on the reef. Sixteen individuals or families are now part of the growers' network, harvesting patches located at nutrient-rich hot-spots on the reef. Sales are approximately 1,600 kg/month valued at approximately $12,000/month, almost all of which is paid directly to growers or to limu handlers working at the central cooperative. Molokai ogo has captured a significant portion of the fresh ogo market in Hawaii; it is the only source of native, long ogo.

As we have attempted to expand the number of community participants, we found that only 15 percent of sites which were planted on the reef actually developed harvestable crops. Therefore, we have conducted research to determine the factors controlling growth on the reef, so we can predict where productive patches can be established. Three laboratory-scale experiments and two field studies have been conducted on factors controlling ogo growth. The most informative has been a field experiment conducted at six sites on the reef at three different seasons of the year (October, 1997; March, 1998 and June, 1998). The sites are areas from which growers harvest ogo. We placed out ten to 20 test rocks inoculated with spores and measured ogo production on each rock over 21 days during each experiment. We also measured water quality factors at seven day intervals during each experiment. The water quality factors were: salinity, water motion, temperature, nitrate, ammonia and phosphate content. The study has produced a striking finding: biomass production is strongly correlated with ammonia ($r = 0.91$, $P<0.001$), but not with any other water quality factor ($P>0.05$). Both biomass production and ammonia were skewed towards low values.

Based on these results we are surveying the reef for ammonia "hot-spots" at which we can locate productive ogo patches. Most of the reef is low in nutrients, but hot-spots occur where land run-off brings in nutrients. These spots include areas with shoreline housing developments, shrimp farms and cattle grazing. The amount of ammonia needed to stimulate ogo growth is very low—140 parts per billion ammonia was the highest level measured on the reef (well below drinking water standards). Ogo patches established near ammonia hot-spots can help in controlling nutrient inflow onto the reef as well as providing a cash crop for residents.

One journal article has been published in Aquaculture and one has been submitted. A 'Ohana Growers Network is established to train and recruit community members, working through the Limited Resources Aquaculture Program (LRAP), funded by the Queen Liliuokalani Children's Center on Molokai. The LRAP program will be the primary means by which we expand the program.

Economic Analysis

Ke Kua'aina pays $6.60 per kg to growers and sells its harvest for $7.15 per kg. Growers make from $50 to $1,200 per month. Ke Kua'aina currently markets 1,500 to 1,700 kg/month for a gross income of approximately $12,000 per month, almost all of which is disbursed to the community through direct payment to growers or salaries to ogo workers who maintain cages and clean and market ogo (Ke Kau'aina is a non-profit organization which does not charge overhead to the project; its administrative costs are supported by the Schroll Trust, and endowment fund to benefit native Hawaiians on Molokai).

Potential Benefits

The coastal residents are attempting to demonstrate the economic value of the south reef for sustainable agriculture and aquaculture, partly as a means to resist pressure for urban development. The project has been the first economic success of the dispersed aquaculture efforts utilizing the fishponds. Molokai is currently the *only* source of native, long ogo in Hawaii and it has captured a large portion of the total ogo market, which is also supplied by tank culturists working with a *Gracilaria* species imported from Florida. The culture method emphasizes community participation and sustainable methods that enhance the supply of ogo on the reef for everyone, as the ogo spreads by spores to other locations. Ogo culture also helps control nutrient levels on the reef and does not require chemical fertilization of patches. We believe this project will become a model for sustainable aquaculture development in Hawaii and the Pacific.

Farmer Adoption and Direct Impact

The coastal residents who participate are mainly fishermen and other subsistence-level users of the reef resources. They have readily adopted to this form of aquaculture as it involves harvesting from the open reef. They are protective of their ogo patches and there has been some friction between growers over who can plant in good locations, as the entire reef is in public domain. In general, growers harvest from an area in front of their own property. As the program expands, the growers network will need to develop ground rules on participation. Control can be exerted through the cooperative which markets ogo, as it is impractical for individual growers to ship their own product to buyers in Honolulu.

Producer Involvement

Sixteen outside growers, plus five to ten hourly employees at Ke Kua'aina, are involved in ogo production. Participation at workshops and training sessions has ranged from 20 to 40.

Future Recommendations or New Hypotheses

The project is advancing on schedule. Now that ammonia has been identified as a limiting factor, a decision is required whether to introduce methods to fertilize the crop, or to concentrate production at the fertile hot-spots, as discussed above. This will be a community decision, but so far the strong inclination is not to introduce additional outside nutrients to the reef, since that would not be compatible with the oligotrophic nature of the reef. There are sufficient spots where nutrients enter the reef from human land-use practices to expand ogo production on Molokai and elsewhere in Hawaii and the Pacific. The cage cultures are fertilized once a week on land and the nutrients are recycled through a ditch system prior to discharge. Ke Kua'aina now plans to add other aquaculture components to the system, including a shrimp hatchery to produce specific-pathogen-free larvae, utilizing the ogo hatchery facilities, and mullet culture in floating ogo cages.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-034

Enhancing No-Till and Conservation Farming Success Through the Use of Case Studies, Conferences, and Workshops to Facilitate Farmer-to-Farmer Learning in the Pacific Northwest

Location:
Inland Pacific Northwest: Oregon, Washington, and Idaho

Funding Period:
July 1997 –

Grant Award:
$125,842

Project Coordinator:
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Ellen B. Mallory, Associate in Extension and Research, WSU

Cooperators:
(All farmers)
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Tim, Kurt and Kevin Melville, Enterprise, OR
Pat Barker, Dayton, WA
John Rea, Touchet, WA
Jack and Mike Ensley, Colfax, WA
Nathan and Steve Riggers, Nezperce, ID
Dale and Gary Galbreath,

(continued)

Objectives

This project seeks to improve the adoption of no-till and conservation tillage practices by sharing the success and field-based wisdom of established practitioners with other farmers and agricultural advisors.

1. Produce detailed case studies of successful farmer-implemented no-till and conservation tillage farming systems and distribute as extension publications.

2. Organize a farmer-to-farmer conference to highlight and discuss successful no-till and conservation farming systems in use throughout the dryland cropping areas of the Pacific Northwest.

3. Organize "training of trainers" workshops to enhance the capacity of extension educators, NRCS personnel, and farmers to assist farmers in identifying and implementing no-till and conservation tillage farming systems appropriate for their environmental and economic practices.

Abstract

Great interest in no-till and minimum tillage exists in the Pacific Northwest (PNW) due to recent changes in federal farm programs, increasing economic pressures and the ever-present need to preserve soil resources. Although 65 percent of the dryland acreage in the PNW is still conventionally tilled, the region is fortunate to have an increasing number of growers who, based on available research and their own experiences, have developed and implemented highly successful no-till and minimum tillage programs. Their "working knowledge" of these farming systems can provide invaluable guidance to other farmers who are considering adapting them to their farms.

This SARE project seeks to improve the adoption of no-till and conservation tillage practices by sharing the success and field-based wisdom of these established practitioners with other farmers and agricultural advisors. Fifteen case studies, to be published as Pacific Northwest Extension bulletins, are being developed that highlight successful farmer-implemented no-till and minimum tillage farming systems. These cases include details of the grower's farming practices and equipment; decision-making factors affecting the adoption, implementation and continued use of these practices; challenges faced by the growers and strategies used to address them; economic analyses; and, when appropriate, summaries of research data that supports an aspect of the growers operation (e.g., continuous cropping vs. wheat/fallow).

Multiple visits were made to these 15 farmers throughout the season, with emphasis on visiting during critical operations such as seeding and harvesting. The multiple visits serve a number of purposes. First, they help us build a relationship with the growers, fostering their trust. Second, they help us gain a more comprehensive understanding of the farming operation. Photos, to be used in the case study publications, were taken at all visits. Three case studies have been written, edited by the farmers, reviewed for publication by other growers, extension specialists, and one industry representative, and are now in the publication process. Having built a foundation with the other 12 growers, we are ready to begin writing their cases this winter. All will be available on-line.

"Train the trainers" workshops, featuring the case studies, will be developed and conducted for NRCS and extension personnel in 1999. Northwest Direct Seed Intensive Cropping Conferences provide another forum for farmer-to-farmer learning about no-till and min-till systems. There was tremendous interest in the January 7 to 8, 1998 conference which drew almost 900 people and featured 48 speakers including growers, ag researchers, industry representatives and commodity groups. Over 170 extra con-

Ritzville, WA
Sam Seale, Condon, OR
Wayne Jensen, Genessee, ID
Art Schultheis, Colton, WA
Frank Lange, Garfield, WA
Steve Shoun, Dayton, WA
Frank Mader and Tim Rust, Echo, OR
Mike Sr. and Mike Jr. Thomas, Prescott, WA
Steve Mader, Pullman, WA
Paul Williams, Reardan, WA

ference proceedings have been sold and 150 videotapes of the conference have been sold or loaned. The proceeding was put on the PNW STEEP Home Page (http://pnwsteep.wsu.edu) under the new 1998 Conference section. The 1999 Direct Seed Conference, planned for January 5 to 7, 1999, will again feature grower talks, as well as a new Trade Show. An audience of 1,200 to 1,500 is expected. The program will feature 37 speakers, including 14 researchers and seven industry representatives, and 16 growers from across the Pacific Northwest, Northern Great Plains, Canada, Argentina, and Brazil. At the request of growers and Ag industry in the evaluation of the 1998 Conference, a new Trade Show will be a special feature of the 1999 Conference. It will include extensive commercial and educational exhibits to provide growers, ag industry and researchers more opportunities to discuss technology needs and share new innovations. By sharing the working knowledge of experienced growers, we hope to enhance the success of no-till and minimum tillage farming in our region.

Potential Benefits

This project has the potential to increase the number of farmers in the tri-state region who successfully adopt no-till and conservation tillage. By sharing the experiences of established no-till growers we hope to encourage others to try no-till and help avoid the downfalls and economic stress that can come with adopting a new system. But the impact goes beyond that. No-till itself can conserve and improve the soil resources, conserve moisture, and help farmers reduce their costs and improve their profitability.

Farmer Adoption and Direct Impact

While we do not have any specific examples of farmers changing to no-till or a conservation tillage system as a result of our efforts, we do know that the interest and demand for farmer-based knowledge of these systems is great, as evidenced by the tremendous turnout at the 1998 Direct-Seed Intensive Cropping Conference.

Reactions from Farmers and Ranchers

Conference Evaluation: Participants of the 1998 Direct-Seed Intensive Cropping Conference were asked to complete a evaluation and provide input on plans for the 1999 Conference. Based on a 1 to 5 scale (1 = poor; 5 = excellent), growers gave the overall Conference a 4.4 average rating and 99 percent felt that the Conference will help increase the success and adaptation of direct seed systems in the Northwest.

Case Study Review: In addition to going through the formal review process for an extension publication, we sent two of our initial case studies and a survey to five non-case-study growers and two ag advisors (extension and industry) to give us an idea if we were on the right track before we started to write the others. All reviewers said that the case studies would help other growers understand the benefits and challenges of direct-seeding, encourage others to try direct-seeding and help them be successful. Specific suggestions from the reviewers were incorporated into the case studies.

Producer Involvement

A total of 46 growers have been directly involved in this project to date. Sixteen growers gave presentations about their conservation tillage and no-till operations at the 1998 Direct Seed Intensive Cropping Conference. Twenty-five growers have been interviewed, with 14 of those visited multiple times, for the case study project. Five growers served as reviewers of the first two case studies produced.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-043

Building Community Support for Agriculture on the Urban Edge

Location:
Washington

Funding Period:
July 1997 –

Grant Award:
$113,000

Project Coordinator:
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Major Participants:
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Wilbur C. Anderson, Horticulture Scientist, Washington State University (WSU)
Dick Carkner, Extension Economist, WSU
Bob Hart, County Commissioner, Owner-Operator, Hart Farm
Ron Hawkins, U.A.P. Pacific
Dave Hedlin and Serena Campbell, Owner-Operators, Hedlin Farms
Nancy Liggett, Water Quality Program Coordinator, WSU
Don Wick, Economic Development Association of Skagit County

Cooperators:
Jim Baremore, Skagit County Historical Museum
Mike Brady, Distinguished Toastmaster and Speech Trainer
John Fawcett-Long, Western Sustainable Agriculture Working Group (SAWG)
Carolyn Kelly, Skagit Conservation District

(continued)

Objectives

1. Develop a participatory model for building a community coalition to support agricultural communities on the urban edge.
2. Examine the socio-economic and ecological components of sustainable agricultural landscape systems.
3. Increase public (farmer and consumer) knowledge and appreciation of the socio-economic and environmental benefits to the community of the agricultural landscape.
4. Disseminate lessons learned from this coalition-building approach to organizations and leaders that share a commitment to the future of urban edge agriculture.

Abstract

This project is located in the Skagit Valley of northwestern Washington, an area where rich alluvial soils combine with a mild maritime climate to create a prime area for agricultural production. Increasing urban population and a widening gap between farmers and consumers threaten the agricultural economic base of the region. Prime farmland in the Skagit Valley is being lost at two to four times the rate of less productive agricultural land, and the number of acres in agricultural production has dropped from approximately 140,000 acres in 1960 to 90,000 acres in 1992.

The goal of this project is to build community support for agriculture by increasing communication and understanding between farm and non-farm residents of the Skagit Valley and the region. We hope to accomplish this by increasing the community's appreciation of the ways agriculture contributes to the quality of life enjoyed in the Skagit Valley, and to increase awareness of how the entire community benefits from the presence of agriculture.

By increasing community members' knowledge of agriculture and the economic and aesthetic benefits it provides, we can increase the long-term sustainability of the wider community, its landscape attributes, and its economic and agricultural bases.

Activities of the project include an Agricultural Speakers Bureau to educate the public about the link between agriculture and community quality of life, a Wildlife Habitat Assessment to learn how marginal areas of farmland provide for biological diversity, and a School Program for grade school students and teachers to increase the awareness of the Skagit Valley's rich agricultural presence and its value to the community and the region.

Project leaders and advisors developed an organizational structure for the program and planned a major public event to introduce the project to the community. Habitat assessment of ten woodland areas is nearing completion, and assessment of ditches and sloughs will start in early 1999. Planning teams for both the Agricultural Speakers Bureau and the School Program meet regularly to develop and organize these activities. A project newsletter was developed as a means of keeping volunteers, major participants, cooperators and others informed about project activities. The first issue was published in September 1998.

Local dissemination of project findings will be conducted through workshops, presentations and displays at western Washington meetings and conferences. An electronic posting of findings will be developed for

Bob Rose, Owner-Operator, Rose Farm, Skagitonians To Preserve Farmland
Howard Shapiro, Teacher, Bayview Elementary School
Terry Stevens, Padilla Bay National Estuarine Research Reserve
Bob Wagner, American Farmland Trust

the Sustainable Agriculture Network (SAN). A printed fact sheet will be written for the Agriculture and the Environment: Partnerships for the Future series.

Knowledge gathered from farm habitat assessments will be shared at Farm Habitat Workshops, via the Speakers Bureau, and in a four-page fact sheet. Additional dissemination of findings will occur through local and regional newsletters, e.g. Skagit Crop Topics (Cooperative Extension), Pacific Northwest Sustainable Agriculture Newsletter, and the newsletter of the Skagitonians To Preserve Farmland.

Potential Benefits

Sharing the Skagit evolved out of informal discussions held by a group of people committed to enhancing broader public support for agriculture on the urban edge. The group was made up of representatives from the following areas: farming, agricultural research and extension, agricultural land preservation, economic development, wildlife and conservation education, agri-business, and agricultural economics. Based on discussions with this group, *Sharing the Skagit's* aim is to enhance community understanding of how agriculture is integrated with the total quality of community life, including landscape, wildlife, open space, quality food, and economic viability.

The potential benefit to agriculture of this project can be summed up in two quotes. The first quote is from a member of the WSU/Skagit County Cooperative Extension Advisory Committee. After hearing a presentation about the project she commented, "*Sharing the Skagit* is so important for educating consumers. I had no idea what farming is all about until I began to hear about it through your program."

The second quote is from Wendell Barry, who said, "One of the growers' best allies is an informed public."

Producer Involvement

Three producers are members of the project's Informal Advisory Group. Two producers are members of the Agricultural Speakers Bureau Core Team. Eleven volunteers and two extension personnel comprise the Speakers Bureau Core Team. This group is organizing the framework for the Speakers Bureau, which includes developing guidelines for operation, determining messages to be conveyed to the public, establishing methods for maintaining quality control, and selecting target audiences. About 14 producers have volunteered to be part of the Agricultural Speakers Bureau. It is most likely that several more will be involved, as recruiting has just begun. Two producers have wooded areas that are part of the woodland habitat assessment.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

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Annual Results

SW97-045

Decomposition and Nutrient Release Dynamics of Cover Crop Materials

Location:
Five Points, California

Funding Period:
July 1997 –

Grant Award:
$41,604

Project Coordinator:
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Major Participants:
Tim Hartz, Cooperative Extension Vegetable Crops Specialist, UCD
Stu Pettygrove, Cooperative Extension Soil Specialist, UCD

Cooperators:
Twelve farmer participants in the on-farm demonstration project extending biologically integrated farming practices within the San Joaquin Valley's West Side

Objectives

The objectives of this research are:

1. To compare potential cover crops or cover crop mixtures in terms of dry matter production and total nutrient content.

2. To monitor the loss of weight and the percentage of nutrients remaining as indicators of cover crop decomposition.

3. To compare the estimated amount of nutrients released from cover crops by the bag method vs soil sampling.

4. To showcase this work by holding periodic field data update meetings for interested people including local participating farmers in the West Side On-Farm Demonstration Project.

Abstract

The West Side of the San Joaquin Valley is one of the most productive agricultural regions of the world. The leading crops of this region include processing tomatoes, cotton, onions, garlic, cantaloupe and lettuce that are grown on over 570,000 acres annually. During the last 30 years, land use patterns on the West Side have changed considerably. Over 60 percent of the acreage in this area was typically planted to wheat, barley and safflower in 1965, whereas in 1994, these crops were grown on less than 7 percent of the area. The intensification in the production of high-value crops has led to fewer additions of organic matter to the soil, more aggressive tillage operations and a reported decline in soil quality.

In the fall of 1995, a group of 12 West Side farmers in conjunction with a team of University of California extension advisors, specialists and researchers, as well as other public and private agency consultants, initiated an extensive on-farm demonstration project of soil building practices and pest management options in this intensive row crop region. This project, extending biologically integrated farming practices within the San Joaquin Valley's West Side, is evaluating sixteen on-farm demonstration comparisons of biologically soil building/pest management systems with conventionally managed systems.

In each of the biologically integrated parcels, cover crops and composted organic materials are integrated into rotations wherever appropriate, whereas in the conventionally managed parcels mineral fertilizer applications are made. Key soil physical, chemical and biological attributes are currently being monitored at each site. Where there is considerable dogma about the difficulty of increasing organic matter and humus contents of soils such as those of the irrigated, arid and hot Central Valley, very little is actually known about basic mechanisms and rates of organic matter decomposition and nutrient release under customary crop management conditions of this region. If farmers are to invest wisely in organic soil inputs, as a possible means of conditioning their soils and efficiently cycling nutrients, they will need much more information than is currently available on these aspects of organic amendments.

This research project is comparing three cover crops, barley, lana woolypod vetch, Phacelia and a barley/vetch mix in terms of biomass production, nitrogen content, decomposition and nutrient release dynamics. The study is being conducted at the University of California West Side Research and Education Center which serves as the organizational and educational activities hub of our local on-farm demonstration project. In August and September 1998 this field was planted with a sorghum/sudan hybrid crop so

as to create more uniform water and fertility initial conditions for the start of the cover crop work. The sorghum/sudan was mowed, baled and removed in late September. The field was then leveled and 40" beds were prepared. On October 26, 1998, the four cover crops were planted in 0.09 acre (14 ft x 280 ft) plots replicated six times. Plant biomass determinations have started and will be continued every two weeks during the winter. Neutron probe access tubes have been installed for routine determinations of soil water content under the cover crops and in fallow plots.

Due to quite severe irregularities in the experimental field that was assigned to us in 1997 when we had expected to initiate this field, we requested and received from WRSARE a no-cost extension which has enabled us to begin the experimental work in the fall of 1998.

Potential Benefits

Winter cover cropping is an alternative agricultural practice that has received much attention as a means of ameliorating soil physical properties and for contributing to pollution reduction. It has been shown to increase soil water retention and infiltration and to decrease soil surface strength. Keisling et al. (1994) showed that hydraulic conductivity and bulk density were significantly improved as a result of winter cover-cropping. The use of winter cover crops also has been shown to be effective in stabilizing soil aggregates and improving porosity. Surface water quality is improved as sediment and nutrient-bearing runoff decreases.

However, benefits of improved soil physical properties and water quality must be evaluated in light of the economic costs of additional management, water demands and potential impacts on crop quality and yield. Over the last several decades, cover crops have not been widely used in Central Valley row crop production systems because of the many uncertainties associated with their management. It is hoped that this project will provided needed information on several aspects of possible benefits of cover crops in this region.

Farmer Adoption and Direct Impact

A recent survey of participating farmers in the West Side On-Farm Demonstration Project revealed that 60 percent of them intend to use cover crops more during the next five years. Because this WRSARE-sponsored work was only started in October of this year, it has not yet had direct impact on farmer adoption.

Producer Involvement

A group of 12 West Side farmers are currently involved with the West Side On-Farm Demonstration Project. This WRSARE project will provide opportunities for these farmers to become more familiar with cover crop management in the West Side region by the discussions that will be generated once data are available from the project and through possible on-farm studies that may be initiated pending project results.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

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Annual Results

SW97-049

Development and Implementation of Trap Cropping Strategies for Control of Hemipteran Pests in Pistachio Orchards

Location:
California

Funding Period:
July 1997 –

Grant Award:
$79,858

Project Coordinator:
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Kevin Olsen, Ranch Manager, S&J Ranch

Cooperators:
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Walter Bentley, Area-wide IPM Advisor, Kearney Ag Center, Parlier
Brent Holtz, Farm Advisor, Madera County, UCCE, Madera
Gary Weinberger, Research Advisor, California Pistachio Industry, and Pest Control Advisor, Visalia

Objectives

1. Field evaluate the potential of selected trap crops to reduce hemipteran pest damage in pistachio orchards.

2. Disseminate the information developed on trap crops to pistachio growers.

Abstract

Many California pistachio growers plant cover crops to increase soil fertility, improve water penetration, and reduce pest problems. However, there is some evidence that cover crops also attract and support migratory hemipteran pests. This has led to a polarization of opinions regarding the usefulness of a commonly recommended sustainable agriculture practice. This research sought to resolve this conflict by identifying those cover crop species that attract pests and then using this attraction to improve pest management through the development of a trap cropping program. Working with grower collaborators, we seeded six cover crop species in nine pistachio orchard blocks. The "trap crops" used were: alfalfa, barley, bell-beans, rose clover, Langudoc vetch, and mustard, each planted in a single row down the entire block. Throughout the season, we sampled trap crop species composition and phenology, insect pests in the trap crops, and insect damage in the pistachio canopy.

In only three of nine orchard blocks did the 1997 seeding produce relatively pure stands of the trap crops; the growers' previous years use of cover cropping and resident vegetation left a seed bank in the ground, which produced mixed stands in six of nine blocks. Overall, the most dominant ground covers were barley, mustard, and vetch.

The insects that most concern pistachio growers are the "small bug" (most notable: *Calocoris norvegicus*, *Phytocoris relativus* and *Lygus*) and "large bug" (most notable: leaffooted bug, flat green stink bug, redshouldered stink bug, Uhler's stink bug) pests. Results show that most (but not all) hemipteran pests overwinter outside the orchard. *Calocoris* and redshouldered stink bug overwintered, to some extent, in the orchard; therefore, ground covers may actually increase these pest densities. From March through June, there were differences in the number of hemipteran pests in the different trap crop species. For example, significantly more *Calocoris* were collected in mustard. In the three fields with purer stands of the trap crop, the mustard cover attracted and/or sustained the largest population of bugs, followed by vetch, clover, and alfalfa.

In this first year study, insecticides were not applied to the trap crop in order to investigate seasonal insect population dynamics and movement from trap crop to pistachio canopy. There were differences in early-season nut damage from insect pests, mostly *Calocoris* and *Lygus*. However, there was little or no difference in mid-season epicarp lesion, among trap crop species or clean-cultivated controls, suggesting plant compensation for early-season damage. Feeding studies, conducted in organdy cages, indicated that redshouldered stink bug and leaffooted bug can puncture the pistachio shell and cause kernal necrosis up until harvest. For this reason, a late-season migration of leaffooted bugs, after the trap crops had dried down and were plowed under, necessitated insecticide treatments in all plots and pointed to the seasonal limits of trap crops in pistachios.

The research is conducted in a grower participatory format. Further, we are working with the Areawide IPM Farm Advisor and Farm Advisors in Central Valley pistachio growing regions. Presentations have been made to the California Pistachio Commission, reaching approximately 400 growers and pest control advisors.

Potential Benefits

These hemipterans directly damage the pistachio fruit. Current pest management practices rely solely upon insecticide treatments—a true IPM program does not exist for these pests. This research seeks to better understand movement of important hemipteran pests into the pistachio orchard Developing a trap crop program for pistachios would improve pest control by reducing insecticide use. Further, the addition of trap crops retains other beneficial aspects of cover cropping, such as improved soil fertility and irrigation management, that are vital to sustainable agriculture systems.

Farmer Adoption and Direct Impact

Farmers will adopt trap cropping after methods have proven effective for the larger grower-collaborators and in those fields that can support ground covers (there are water restrictions in some pistachio growing regions). An immediate result of a successful program will be the reduction of insecticides in pistachio orchards. Because many of these hemipterans are also pests of other crops, this research may aid broader-based control programs.

Reaction from Farmers and Ranchers

Grower collaborators are very excited about this work. The reaction of growers that believe in and use a "clean-tillage" system has been mixed. Concerns are water use and the increase of pest insects and tree pathogens in the trap crops that will move into the pistachio canopy. There is better understanding of trap crop use as a monitoring tool for migrating hemipterans.

Producer Involvement

This is a grower participatory study, with research conducted at the S&J ranch and other large farms (e.g. Paramount) providing helpful information on ground cover use in pistachios (and receiving reports on current years progress). The research is coordinated with California Pistachio Industry funded work investigating the role of migratory hemipterans in transmitting a fungal disease (*Botryosphaeria dothidea*).

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

SW97-056

Comparison of Pest Management Interactions in Spring Wheat-Cover Crop and Spring Wheat-Fallow Cropping Systems

Location:
Montana

Funding Period:
July 1997

Grant Award:
$150,964

Project Coordinator:
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Major Participants:
(All MSU)
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William Grey, Dept. of Plant Science
Sue Blodgett, Dept. of Entomology
Bruce Maxwell, Dept. of Land Resources and Environmental Science
Gregory Johnson, Dept. of Entomology

Cooperators:
Robert, Ann, and Earl Boettcher, Farmers, Big Sandy
Marc and Nancy Peterson, Farmers, Havre
Terry Grass, Farmer, Box Elder
John Antle, Dept. of Ag Economics and Economics, MSU-Bozeman
James Sims, Timeless Seeds, Conrad
Jon Wraith, Dept. of Land Resources and Environmental Science, MSU-Bozeman

Objectives

1. Determine and compare geographically referenced distributions of wheat stem sawfly, wild oats, and root rot complex in two cropping systems, spring wheat-fallow and spring wheat-legume.

2. Quantify and compare interactions among pests on spring wheat yield and quality in the two cropping systems.

3. Identify the spatial locations of pest populations in the two cropping systems and identify pest and edaphic factor interactions that can cause variation in spring wheat yield.

4. Disseminate information and economic implications of impact of green manure cropping system on pest management using innovative methods of program delivery.

Abstract

We are assessing the importance of crop diversification and pest interactions in spring wheat production systems by determining spatial associations of pest populations and crop response. Utilizing global positioning systems/geographic information systems (GPS/GIS), we mapped insect, disease, and weed populations, nitrate and water in soil, and wheat grain yield and protein. Fields of wheat following pulses had lower levels of foliar diseases, weeds, wheat stem sawfly infestation, soil water and nitrate, and wheat grain yield. Spring wheat foliar disease ratings increased with increasing kochia, russian thistle, and total weed densities in both cropping systems. The 1998 crop year was characterized by exceptionally low precipitation through spring, above average precipitation in June, followed by extremely high temperatures in July, resulting in severe drought stress in grain fields following pulses.

The overall purpose and plan of the study were presented by Sue Blodgett and Bruce Maxwell to about 75 producers, consultants, and Extension personnel at a Field Day at Robert and Ann Boettcher's farm on 23 June 1998. The study also was presented by Andy Lenssen and Bill Grey to over 100 producers, consultants, and Extension personnel at the Hill County Seed Growers Association annual farm tour on 7 July 1998. Blodgett, Grey, and Lenssen will be presenting findings at Cooperative Extension meetings across Montana during the upcoming winter. We already have been asked to have one of the study fields on the Marc and Nancy Peterson farm to be a stop and presentation site for the 1999 Hill County Seed Growers Association annual field tour and program.

Potential Benefits

When we have completed all three years of this study, we should have a good knowledge base on the impacts of replacing summer fallow with pulse crops in wheat production systems on pest distributions and interactions, soil water and nitrate, and their combined impacts on spring wheat yield and quality. Our information will be useful for precision farming and for producers to make better informed decisions on their choices of cropping systems and variable rate applications of inputs, hopefully allowing for better environmental stewardship and profitability.

Farmer Adoption and Direct Impact

Grain producers in Montana and the northern Great Plains are replacing summer fallow with pulse and oilseed crops because crop options, profitability and sustainability of the traditional wheat-summer fallow system have changed with the most recent federal farm bill.

Producer Involvement

The producer-cooperators have been crucial to conducting and developing this study. The Peterson and Grass farms are growing pulse crops for cash sales instead of as green manures. We have changed our experimental protocols accordingly.

Future Recommendations or New Hypotheses

Because of producer input, we have changed the cropping systems being tested on the Boettcher and Grass farms from wheat-fallow vs. wheat-legume to wheat-barley-fallow vs. wheat-barley-legume. Additionally, at the behest of Peterson and Grass farms, we have substituted pulse crops taken to seed harvest for the green manure plowdown treatment. In 1999, we will be mapping eight fields: two each at the Boettcher and Grass farms and four at the Peterson farm. In addition to common root rot, we will be rating wheat plants for Fusarium crown rot the next two years because we observed good survival of Fusarium on aboveground wheat stubble at the Grass and Peterson farms.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

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Annual Results

SW97-074

Advancing Sustainable Potato Production in the Northwest

Location:
Idaho, Oregon and Washington

Funding Period:
July 1997 –

Grant Award:
$35,000

Project Coordinator:
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Paul Patterson, UI
Frank James, Idaho Rural Council
Brian Finnigan, UI, Bingham County Cooperative Extension
Dave DeCou, Organically Grown Cooperative

Cooperators:
Mike Heath, Farmer, M & M Heath Farms, Buhl
Nate Jones, Farmer, Kings Crown Organic Farm, Hammett
John Ojala, UI

Objectives

1. Through workshops, farm tours, educational materials, and the media, the project will reach 100 potato growers with direct hands-on learning experiences about sustainable potato production and at least another 1,000 growers and other interested individuals will read or hear about these practices through other avenues.

2. The project will build one network of potato farmers.

3. Through farm tours and educational materials the project will reach 30 agricultural lenders and educate them about benefits of sustainable agriculture.

4. The project will work with Kettle Foods, a major Northwest food processor, to build a model processor support program for their conventional and organic potato growers.

5. The project will actively disseminate existing information, production manuals and other appropriate information on sustainable practices.

Abstract

Over 100 farmers and at least another 1,000 farmers and farm community members were educated about the benefits of sustainable agriculture practices in potato production in this SARE project. Through a combination of educational activities—including farm tours, grower meetings, newsletters, and outreach to the press—farmers and farm communities in primarily Idaho but also other parts of the Northwest learned about the benefits of compost and green manures for building healthy soils and breaking up weed, pest and disease cycles in potatoes.

This project generated stories in such agriculture papers as the *Capital Press*, *Magic Valley Ag Weekly*, *Intermountain Farm and Ranch*, *Farm Times*, *Acres* and the *Idaho Farmer-Stockman*. The *Capital Press* and the *Idaho Farmer-Stockman* are regional papers encompassing multiple states. *Acres* is a national alternative farming publication, and the other papers are local agricultural papers. The combined circulation of the local agricultural papers alone is probably close to 20,000 to 30,000.

An exciting new publication profiling growers that use sustainable production practices in potatoes was developed out of this project. *The Farmer Exchange* is a short, easy-to-read newsletter for growers and others interested in learning what their neighbor-farmers are doing. With the help of another SARE project, the first issue will be circulated to 2,400 people across the Northwest. The newsletter is just one part of a larger effort to expand communication between growers about the practices they are trying on their farms.

As a result of this project, between 10 and 15 growers in south central and eastern Idaho are exploring the use of green manures or other alternative practices on their farms. In addition, the Shoshone-Bannock Tribes (the largest agricultural landowner in eastern Idaho, leasing out 150,000 acres for production of potatoes and wheat) is developing a long-term research and demonstration project on 170 acres to explore the use of green manures and different rotation crops that will reduce groundwater contamination and chemical inputs on reservation lease land.

Potential Benefits

This project has focused on educating farmers and others about the benefits of using green manures, compost and crop rotations. It is difficult to quantify the outcomes but we will give a few examples the potential. In February we are going to present a series of "green manure" options to leaseholders on the Shoshone-Bannock reservation. We believe, although we have not run the numbers yet, that over the long-term growers might be better off to do a third year rotation in a green manure or green manure/crop—such as sudan grass or Austrian winter peas—rather than wheat. The green manure crop could eliminate the need for fumigation (which runs $250+/acre), it could reduce the amount of nitrogen fertilizer applied, and it would help prevent leaching of chemicals into groundwater because it would return organic matter to the soil and feed soil organisms. With grain prices at an all time low, a green manure crop that may eliminate the need for fumigation could be very attractive.

Farmer Adoption and Direct Impact

We are aware of between 10 and 15 growers in south central and eastern Idaho that are exploring the use of green manures or other alternative practices on multiple acres of their farms as a result of this project. If these projects are successful we assume that the growers will expand these alternative practices to encompass more acreage. These growers are well-know and well-respected in their communities.

Perhaps the most exciting opportunity that has emerged is our work with the Shoshone-Bannock Tribes. Through our discussions with Tribal representatives the Tribes approved of a long-term research and demonstration project on 170 acres that will look at reducing fertilizer, fumigation and other inputs. The project area is part of an existing lease and will be maintained as a demonstration project for at least 5 years—the term of the lease. We are presently working with Tribal representatives to identify and pull together a technical team, raise additional money, and prepare an options paper for discussion at the first technical team meeting that will happen this winter or early in the spring. Because the Tribes lease so much agricultural land for potato production, some 150,000 acres, we believe that this project has the possibility of changing production practices across a broad landscape.

Producer Involvement

We have roughly 11 farmers involved in this project. Three growers are involved in reviewing each issue of our newsletter, *The Farmer Exchange*. We sponsor conference calls with the growers and our other project cooperators to discuss all our educational activities. We have worked with some growers to develop joint projects and seek support from the SARE Farmer/Rancher grant program. We will ask the growers to help us develop the guidelines for any small grant program that we develop.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

Sustainable Agriculture Research and Education

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Annual Results

AW94-020

Rotational Management of Wetlands and Cropland in the Tulelake Basin

Location:
California

Funding Period:
July 1994 –

Grant Award:
$259,633

Project Coordinator:
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Cooperators:
Tulelake Irrigation District, Lease Land Issues Committee
Dave Mauser, Biologist, USFWS Klamath Basin National Wildlife Refuge
Leon Basdekas, US Bureau of Reclamation, Klamath Falls, OR

Objectives

1. To conduct pilot studies to assess the feasibility of wetland/cropland rotation (flooding of existing cropland to create new wetlands, and drainage of existing wetland to create new farmland) as a long-term management option for sustainable co-existence of irrigated agriculture and wetland reserves in the Tulelake basin.

2. To determine the impacts of wetland/agriculture rotations using various management strategies on: water quality, seasonal dynamics of marshland vegetation and the quality of wildlife habitat created.

3. To compare the ability of managed wetland systems and irrigated cropland to remove or immobilize nutrients and other residues from agricultural drainage water.

4. To test the utility of short-term flooding cycles to control soil borne pathogen and nematode populations within irrigated cropland rotations, and determine the extent of use of these temporary wetlands by wildlife.

5. To assess the socio-economic impacts and policy implications associated with rotational wetland/agriculture management systems.

6. To coordinate this project with other research/planning activities in the Klamath Basin, and facilitate involvement of different community groups, state and federal agencies and other organizations in the development of the pilot projects.

Abstract

Tulelake is a high mountain valley on the California-Oregon border where irrigated agriculture coexists adjacent to the Tulelake National Wildlife Refuge. The refuge is a critical part of the Pacific flyway and with Lower Klamath Refuge supports one million migrating waterfowl, annual waterfowl production of 40,000 and habitat for 411 wildlife species. Concerns facing the basin include: degeneration of wetland habitat, hypereutrophication, pesticide use, declining populations of endangered fish and declining crop productivity due to build up of nematodes and other soil pathogens.

Improved management strategies to sustain agriculture and provide high quality wildlife habitat are needed. One strategy proposed is to flood areas of existing cropland to create diverse wetlands, and drain areas of existing wetland to create cropland free of soil borne pathogens. In this project we have established pilot studies to assess the feasibility of cropland/wetland rotation in terms of crop production, pest control, quality of wildlife habitat created, effects on water quality, and socio-economic impacts. Various management options for newly created wetland and cropland are being investigated. A major goal is to strengthen communication among different sectors of the local community, federal/state agencies, researchers, and other organizations active in Klamath Basin issues, and to incorporate different perspectives into this study as it develops.

During the first three years of the project we have completed baseline soil and water sampling of all the pilot sites, and initiated wetland/cropland rotational management at each location. Vegetation development, impacts on water quality and seasonal water use have been monitored at selected sites. While variation in vegetation development across pilot sites was observed, abundance of desired wetland spe-

cies was observed at most sites by the second year of seasonal flooding. Further, initial data suggest that one year of seasonal flooding significantly reduced levels of parasitic nematodes in the soil.

A digitized base map of the basin was developed in cooperation with the US Bureau of Reclamation office in Klamath Falls. Multiple layers of inherited physical and socioeconomic information together with data collected from the pilot sites have been entered to create a spatial database for the area. This GIS database is being used to develop models to assess the impacts of various management options on economic and environmental aspects of the ecosystem.

We have established a mechanism for cooperation and involvement of local farmers, as well as federal agencies and other interested parties in the research program. The project is somewhat controversial given the highly volatile and politicized issues of water allocation, pesticide use and farming on or adjacent to wildlife refuges. We continue to encourage cooperation and participation of interested parties through the farmers advisory committee, public meetings, and meetings with key organizations.

Potential Benefits

Conceptually this project has broad implications, since it explicitly aims to develop management options that enable agriculture and wetland habitat to coexist in a healthy and sustainable way within the same landscape. It is a unique approach to wetland refuge management, and ideas and lessons learned in the process of the pilot research may have applications in other multiple use conflicts. Specific results to date indicate that seasonal flooding as tested in the short-cycle wetland rotations has the potential to reclaim nematode infested fields while also providing improved wetland habitat for waterfowl within a short-time frame (1-2 years). Water quality effects of seasonally managed wetlands appear to be highly dependent on the balance between surface and subsurface water flow through the wetland. Initial data showed an improvement in surface water quality in the wetland, but a deterioration in water quality as water moved through the soil profile and left the wetland drainage area.

Producer involvement continues to be extensive, through the advisory committee (7 growers), on-farm trials (6 growers) and leasing of pilot sites during cropping phases (4 growers to date).

This summary was prepared by the project coordinator for the 1998 reporting cycle.

Western Region
Sustainable Agriculture Research and Education

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Annual Results

AW95-207

Application of *Pseudomonas corrugata* as a Seed Treatment to Suppress Ring Rot Disease of Potatoes

Location:
Idaho

Funding Period:
July 1995 –

Grant Award:
$36,700

Project Coordinator:
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Cooperators:
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Wayne Davis, Grower, Monte Vista, CO

Objectives

1. Construct site-specific, antibiotic marked, non-pathogenic strains of *Pseudomonas corrugata*.
2. Evaluate the antimicrobial activity and survival ability of the non-pathogenic constructs.
3. Application of the non-pathogenic constructs on potato seed and evaluate their effect on the bacterium (*Clavibacter michiganensis* subsp. *sepedonicus*) in field soil.

Abstract

Transposon mutagenesis was used to develop non-pathogenic strains of *Pseudomonas corrugata*. Nearly 3,000 transposates were screened for antimicrobial activity and for pathogenicity in tomato plants. Of these, four transposed isolates were not pathogenic in tomatoes in preliminary (single plant) and confirmative (multiple plants) inoculations. These four isolates were identical to the wild-type parent in antibacterial and antifungal activity. Other mutant phenotypes observed were those that lost antibacterial activity, antifungal activity, or both. In these later mutants, pathogenicity was maintained.

Economic Analysis

Material and labor cost for production of the bacterial inoculum costs approximately $1.50 per pound. One pound of inoculum will treat 4 cwt of seed potato. An average increase of 50 sacks per acre was obtained. If the average price for a cwt is $4.50, then the average gain/acre would be $225. This would be about a ten-fold return on treatment costs.

Potential Benefits

Treatment with the dry formulation of *Pseudomonas corrugata* was readily adapted with no impact on grower handling. The bacterium was applied as one would apply any powder based fungicide. Results have also indicated that cut seed potato can be treated months in advance of planting. Since the treatment is with a bacterium, there is no introduction of chemical fungicides into the environment. Thus, the treatment addresses the need expressed by the Food Quality and Safety Act of 1996.

Farmer Adoption and Direct Impact

Other growers in the area were impressed with the progress of the treated field. They were amazed with the exhibited plant vigor and yield increases and wanted to find out what "magic" material was used to obtain these results. The cooperating grower wanted 2,000 pounds of inoculum for the 1998 growing season. We were unable to comply with this request as our resources are limited.

Producer Involvement

There were various visits by growers and chemical company field agents but no documentation was provided by the grower.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

Western Region

Sustainable Agriculture Research and Education

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Annual Results

AW96-009

Reduced Herbicide Use Through Improved Mechanical Cultivation and Banding of Herbicides

Location:
Arizona

Funding Period:
July 1996 –

Grant Award:
$121,000

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Cooperators:
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Dave Prechel, Paul Ollerton and Victor Wakimoto, Farmers
Pegasus Machinery Co.
Bingham Equipment Co.
Sukup Manufacturing Co.

Objectives

The goal of this project is to provide cotton growers in the southwestern United States with effective, commercially acceptable alternatives to extensive herbicide use for weed control. To achieve this goal, six objectives have been established:

1. Evaluate and demonstrate cultivator guidance technologies under Arizona field conditions.

2. Evaluate and demonstrate the potential for revitalizing old in-row and close-to-the-row cultivation technologies which were abandoned when herbicides were introduced.

3. Evaluate and demonstrate guidance systems in combination with herbicide banding.

4. Develop and evaluate at least one new cultivation system.

5. Compile operational and cost data on reduced herbicide vs. conventional weed control systems.

6. Disseminate information relative to the advantages of alternative weed control systems.

Abstract

Field trials were conducted to evaluate implement guidance systems. Two were of the articulated design (Buffalo and Accutrac), and one used a slide system (Sukup). The trials used two evaluation techniques. In the first case a series of rods were positioned in boards set along a straight line, with the rods simulating a row of cotton plants. For the second setup two furrows were constructed to guide the cultivator. One had a distinct V shape, while the second was constructed having a bottom 10 inches wide. The trials consisted of initially driving the tractor parallel to the rods and furrows, and then turning away from them along a set path.

A six row cultivator was used for the trials. To evaluate the effect of wand position on performance, trials were conducted with the wand set on the first and then on the second rows. Cultivator position was measured for the sixth row, with each test replicated five times. Tractor position was measured relative to the rods or furrows, with the tractor driven off course a distance of up to 22 inches.

Field trials showed that mounting the sensing wand on the second rather than the first row increased the guidance system's ability to follow rows of cotton plants. A slide guidance system provided better accuracy than either of the two articulated systems tested, in that it kept the cultivator closer to the row, as the tractor deviated from a path parallel to the row.

A mechanical digger designed to lift nutsedge tubers, from depths of up to 6 inches, to the soil surface where the sun could dessicate and kill them proved to be functionally acceptable. Unfortunately tubers deeper than 6 inches were able to send shoots to the soil surface. Tilling deeper than 6 inches was considered to be energy inefficient, and hence this technique holds little commercial promise.

The precision guided cultivator, which is equipped with beet hoes set to cultivate to within 2 inches of either side of the row, required three times the energy of a conventional system set up with rolling cultivators spaced 4 inches on either side of the row. The increased energy requirements were not considered to be so great as to preclude the use of such systems, however, since the increased weed control and decreased field time obtained with the precision system would more than compensate for the increased energy required.

Two field days were organized in Pinal County, and one in Mohave County to demonstrate practices to reduce herbicide costs by using guidance systems and precision cultivation in conjunction with the use of Staple, Roundup Ultra (in conjunction with Roundup Ready Cotton) and Buctril (in conjunction with BXN cotton). The Pinal County demonstrations were conducted in Coolidge on June 22, 1998 and in Stanfield on June 26, 1998. Four people attended the first field day, and seven people attended the second. A well attended field day held in Pinal County in 1997 appears to have satisfied the interest in Pinal County to see the precision cultivator in action. Since that field day was held, a number of guidance systems and cultivators have been purchased in Pinal County. The Mohave County field demonstration was conducted with Victor Wakimoto and was attended by four people (half of the farmers in the valley were represented). As a result of this demonstration a guidance system was purchased, and a cultivator was set up to be used with it.

Potential Benefits

Adoption of mechanical weed control methodologies will have several benefits:

1. Reduction of hand weeding costs for annual morning glory and other broadleaf weeds from \$50 to \$100 per acre to zero.

2. Reduction in weed competition resulting in increased yield.

3. Reduction in chemical use through the elimination of preplant incorporated broadleaf herbicides such as prometryn for a reduction in chemical use of 1.2 to 1.6 pound of active ingredient (a.i.) per acre and a cost reduction of about \$9.50 to \$12.67 per acre.

4. Increase in farm profits as a 150 percent increase in cultivation speed and a corresponding savings of fuel, labor and future capital costs, associated with needing fewer tractors to farm the same number of acres, can be realized.

Farmer Adoption and Direct Impact

Changes in practice: the adoption of articulated guidance systems, close cultivation and in-row weeding technologies as well as the use of banded applications of postemergence herbicides rather than broadcast applications of preemergence herbicides has taken place. Over the past two years many articulated guidance systems for use with cultivators have been purchased for use with cultivators and other farm implements. This represents the beginning of widespread adoption of these practices.

Future Recommendations or New Hypotheses

Additional reductions in herbicide use can be achieved by using precision guidance systems for early season band applications of Buctril, Roundup Ultra and Staple herbicides. Standard band applications are usually about 15 inches wide. With close cultivation and accurate spray placement, this width can be reduced to about 8 inches, reducing herbicide use by approximately half.

Before cotton plants are large enough to be detected by the sensing wands, reference furrows and furrow tracking devices must be used to guide the cultivator and permit mechanical eradication of weeds. Thus next year the use of reference furrows and furrow tracking devices in conjunction with precision guidance systems will be researched for the precision application of herbicide bands and for close cultivation. Also the use of a single over-the-top herbicide application of Staple or Roundup Ultra, followed by precision in-row cultivation for weed control in cotton, will be investigated.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

Sustainable Agriculture Research and Education

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Annual Results

AW96-013

Control of Leafy Spurge by Grazing Goats—A Demonstration

Location:
Idaho

Funding Period:
July 1996 –

Grant Award:
$15,400

Project Coordinator:
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Cooperators:
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Kevin Koester, Chairman, Portneuf Soil and Water Conservation District
Pat Brown, Senior Resource, Manager, Idaho Department of Lands

Objectives

The objectives of grazing leafy spurge with goats are to evaluate the economic and biological efficiency of this control method for managing leafy spurge.

1. To distribute the data and findings of the research project to practitioners and professionals through out the region.

2. To develop information materials and displays providing data on the progress and results of the project.

Abstract

No findings to date. The project will publish results after the spring 1999 research is completed.

Potential Benefits

There have been many studies on the benefits of grazing sheep on a variety of weeds, including leafy spurge, while little has been provided on the benefits of goats, especially on farm research. The research that has been completed shows that goats have a preference to leafy spurge over sheep. But what environmental and economical impacts will grazing goats have to the range and the rancher? This project hopes to show that the grazing of goats is a viable (economic) alternative to spraying as well as providing an alternative crop (goat meat) and income for the rancher. The impacts to the rancher and agriculture will be one of sustainability. Sustainable because it adapts the management to the land rather than trying to change the land to suit the management. For years the rancher has been battling leafy spurge with whatever new chemical is available, hoping for that silver bullet. To date, the industry has not found a successful management program and the leafy spurge continues to prosper. This project has the potential to change people's opinions on biological control as a management tool, in particular the use of goats as that tool on their ranch. And if they accept the idea of grazing goats along with their cattle, we will see a decrease in chemical use, lower input costs and fewer pollutants reaching our streams and lakes. We will also see the introduction of a new product for the ranching community.

Farmer Adoption and Direct Impact

It is too soon to say that we have seen farmer adoption. What we can say is that there is a change in attitude. When this was first discussed with the ranchers in the Downey area we received a lot of skepticism and smiles. The ranchers were not sure they wanted goats on their range. They also did not believe goats could do what chemicals could not. Since that time, with the small success we have seen and the discussions we have begun with other ranchers using goats on their pastures and range, the Downey group has accepted the idea that goats just might be an alternative or a tool in the management of leafy spurge.

Producer Involvement

There are 14 producers and/or landowners involved in this project, two of which are cooperators. The others are involved in a number of different ways. The two cooperators are the representatives for the 14 landowners (stakeholders) in the project area. They have attended all of the planning meetings and assist in management decisions. They act as the local coordinators or liaisons for the project. Two other landowners have provided the needed coordination during the actual herding season. They assist the herder in any way, contact the project coordinator if supplies are needed, if the herder is not following the grazing plan, or any other items or concerns that might come up in field. They are the eyes for the agencies and fiscal sponsors. Other landowners contribute by donating hay, attending planning meetings thus providing the needs and concerns of the landowner and the management of their lands.

Future Recommendations or New Hypothesis

This has been a difficult project to implement. The task force (planning committee) had everything laid out for a successful and smooth project. It was impossible to foresee the problems that have been prevalent in this project. For various reasons, we essentially lost two years on the project. The project sounds rather simple: acquire 1000 goats, put them out on the range, develop research plots and grazing plan, collect data, evaluate data, make changes for second and third year, and report findings. Enter in the social aspects of a new and different technique and you have a recipe that requires constant mixing and refining.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region

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Annual Results

AW96-014

The Impact of Riparian Vegetation Filters on Western Soil and Water Quality: Nonpoint-Source Pollutants from Range and Croplands

Location:
Wyoming

Funding Period:
July 1996 –

Grant Award:
$94,475

Project Coordinator:
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R. Baumgartner, Goshen Co. Conservation District
S. Ross, Horse Creek Conservation District
R. Amundsen, Wyoming Game and Fish

Objectives

The objectives are to determine:

1. Establishment rate, biomass production and nitrogen (N) and phosphorous (P) uptake by hybrid willow and grasses under greenhouse and field conditions of variable soil salinity.

2. The impact of vegetation filters on N and P concentration and load in groundwater and streamflow.

3. Denitrification rates (spatially, seasonally, at various depths) in riparian soils before and after installation of vegetation filters, and to estimate the contribution of microbial denitrification to total nitrate removal from nonpoint sources before and after installation of vegetation filters.

4. The physical effects of stubble height/grazing residue of grazed tall wheatgrass vegetation filters on sediment entrapment.

5. Differences in local and non-local landowner reaction to pro-active philosophy and strategy of the project and to determine the most effective methods of disseminating study results.

Abstract

Thirty cattle exclosures, each 50 x 100 ft., were constructed and prepared for seeding in the Horse Creek riparian area on the Rottman Ranch, Hawk Springs, Wyoming, 15 on the rangeland side and 15 on the corn/alfalfa cropland side. Three replications (exclosures) per land type were planted with 1) hybrid willow cuttings in 6/97, or broadcast seeded in 3/97 to 2) tall wheatgrass, 3) creeping foxtail, 4) beardless wildrye, or 5) basin wildrye.

All but 3 plantings failed to produce an acceptable stand because of excess salinity, drought, unfavorable seeding conditions, or seed with low germination rates under saline conditions. The stands were re-planted in late winter and early spring 1998 after new seed and varieties were tested in a germinator under saline conditions. Jose tall wheatgrass establishment in a greenhouse study using Horse Creek saline and saline-sodic soils was >92 percent under salinity levels of 1.6, 3.5, and 6.8 deciSiemens (dS), but hybrid willows establishment was 93 percent, 52 percent, and 0 percent for 1.6, 3.5, and 6.8 dS, respectively. However, all surviving plants reached soil depths of 0.8 m within 150 days of growth and are therefore capable of extracting ground water during the first growing season.

Different nitrogen concentrations in both tall wheatgrass and hybrid willow subjected to different salinity levels, N and P soil water concentrations, and lengths of growing season indicate that grass and willow should be harvested and/or grazed every 90 to 120 days to maintain the optimum nitrate extraction plant vegetative stage and remove the maximum N from the riparian system. Grass and willow leaf, stem (willow only), and root weights, root distribution (%), and N concentrations per plant part and top and bottom soil column halves were determined for all treatments.

Jose tall wheatgrass is the best adapted to high saline-sodic conditions. Plant uptake of N varies with salinity level, but the relationship is confounded by plant species and length of growing season before harvest. Because hybrid willows were determined to be inappropriate for highly saline/sodic conditions, we planted hackberry, cotoneaster, New Mexico privet, coyote willow, and black locust upon recommendations from the local USDA NRCS office. All tree seedlings were significantly defoliated by a severe grasshopper population, but New Mexico privet and black locust were the most successful. Two, shallow

(i.e., ca. 1.0 m deep) groundwater wells were established in each exclosure. Water samples were collected on 1 November and analyzed for nitrates concentrations. All samples showed < 1.0 mg NO3/l water or well below the maximum allowed by US EPA.

Economic Analysis

The financial implications to ranchers of the project results to date are mixed. Indications are that riparian plantings should be fenced from grazing until established and then grazed in a rotation system to maintain the optimum vegetative stage for nutrient uptake from ground water. Fencing riparian pastures is extremely expensive because of their configuration. However, there are existing cost-share programs which encourage fencing riparian pastures for rotation grazing. In addition, greenhouse results indicate the capacity of both tall wheatgrass and hybrid willow to produce very high quality fodder which could be useful for flushing breeding animals or for animals with high nutrient requirements.

Potential Benefits

Saline riparian areas dominated by inland saltgrass produce about 6 AUM/ha whereas tall wheatgrass or hybrid willow pastures under nutrients levels common in these areas produce about 12 AUM/ha or twice the production and twice the quality (only under optimum management) that of native saltgrass. In addition, tall grasses and agroforestry pastures produce critical winter cover for native game birds and ungulates. The greatest potential impact is that vegetation filters which must be harvested to remove extracted nutrients from the system and that reduce ground water nutrient loads to environmentally acceptable levels will justify the continued agricultural use of riparian areas and permit the continued use of upland range and cropland areas.

Farmer Adoption and Direct Impact

On the basis of results to date, cooperating ranchers applied for and received a cost-share program involving fencing a portion of a riparian areas for separate wetland and agroforestry experimentation.

Tall wheatgrass (and similar tall saline-tolerate grasses) in riparian areas should be test-harvested at different frequencies and/or seasons and analyzed for forage or hay quality to determine the optimum grazing/harvesting frequency to produce the combination of quantity and quality which best fits each rancher's total forage needs.

Future Recommendations or New Hypotheses

1. Recommended saline/alkali-tolerant pasture and conservation plant species should be tested under field conditions of variable sodic-saline conditions to determine the N and P extraction and forage quality potential (i.e., optimum, upper limits, range of response).

2. Unpalatable tree species should be evaluated for livestock shade potential as well as palatable tree species for browse.

3. What soil amendments and/or management practices will mitigate the negative effects of soil salinity and alkalinity?

4. What seeding techniques increase establishment rates under soil sodic/saline conditions common in western riparian areas?

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western SARE

Final Results :

Sustainable Agriculture Research and Education, SARE

Agriculture in Concert with the Environment, ACE

Western Region
Sustainable Agriculture Research and Education

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Final Results

LW93-033

Development of Sustainable Crop and Livestock Production Systems for Land in the Conservation Reserve Program (CRP)

Location:
New Mexico

Funding Period:
July 1993 – August 1998

Grant Award:
$312,000

Project Coordinator:
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Cooperators:
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Terry Canup, Dept. of Agricultural Communications, NMSU
Bruce Hinrichs, Eastern District Director, Coop. Ext., Clovis
Buck Allen, Coop. Ext.,

(continued)

Objectives

The overall goal of the project was to develop economically viable crop and livestock production systems to extend the wildlife and environmental benefits of the Conservation Reserve Program (CRP) beyond the ten-year contract period while maintaining compatibility with existing production systems, established farmer goals and external production constraints.

1. Develop livestock grazing systems for the predominate grass species growing on CRP land.

2. Identify dryland cropping systems for converting CRP grassland to sustainable crop production.

3. Compare the potential environmental impacts of the production systems evaluated in Objectives 1 and 2 with traditional crop and livestock production systems and current use of CRP land.

4. Identify and demonstrate techniques for improving and maintaining wildlife habitat on CRP and post-CRP lands.

5. Conduct an economic evaluation of alternative production systems including: a) whole farm cost and return analysis, b) short- and long-term profitability analysis, and c) risk analysis.

6. Determine the compatibility of potential production systems with existing production systems, established farmer goals and external production constraints.

7. Develop an information delivery component to: a) demonstrate various crop and livestock production systems, and b) disseminate scientific, technological and economic information to agricultural producers.

Abstract

The Conservation Reserve Program (CRP) is a long-term cropland retirement program in which eligible landowners and operators voluntarily remove highly erodible cropland from agricultural production for ten to 15 years in return for cover establishment costs and annual payments from the USDA. The Southern Great Plains states of Colorado, Kansas, Oklahoma, New Mexico and Texas have 32 percent of the nation's 29.9 million CRP acres. Many counties in this region have more than 25 percent of the total farmland acreage enrolled in the program.

Perennial grasses cover as much as 99 percent of the CRP land in the Southern Great Plains. As such, there are basically two potential post-CRP uses for this land: 1) convert the land to crop production or 2) keep the existing grass cover and graze the land.

This project evaluated three systems of crop production (wheat-sorghum-fallow rotation, continuous wheat and continuous sorghum) and three tillage systems (conventional tillage, minimum tillage and no tillage) for converting CRP grassland to non-irrigated crop production. Crop yields for all evaluated systems were extremely low or non-existent. The low yields are attributed, in part, to insufficient lead time to initiate cropping practices, unsuccessful herbicide controls, insufficient soil moisture at planting and devastating climatological events.

Seasonal productivity of CRP grasslands was evaluated. Dry forage production ranged from less than 1,000 lb/ac for grama grass to more than 4,000 lb/ac for old world bluestem. Mixed species plantings, kleingrass and weeping lovegrass produced intermediate yields.

Harding County
Wallace Cox, Coop. Ext., Lea County
Jeff Bader, Coop. Ext., Quay County
Floyd McAlister, Coop. Ext., Roosevelt County
David Graham, Coop. Ext., Union County
Carl Hahn, Sunwest Bank of Clovis, Clovis
Danny Tivis, House Cooperative Assoc., House
Ben Creighton, NRCS, Clayton
Ken Walker, NRCS, Portales
Elizabeth Wright, NRCS, Tucumcari

Farmers:

Buck Allen, Mosquero
Louis Glen Brown, Bard
Tommy Campsey, Texline, TX
Ross Duke, Clovis
Lloyd Grau, Grady
Leon Hemann, McDonald
Joe McKown, Lovington
Wayne Palla, Clovis
Gary Ross, Clovis
Winfield Scott, Sedan
Todd Tatum, Logan
Lee Taylor, Sedan

Five grazing management systems were evaluated for the production of stocker calves on weeping lovegrass. Regression analysis was used to estimate average daily gain functions for the grazing treatments. During the early part of the grazing season, average gains were near 3 lb/head for all grazing systems, but weight gains declined as the season progressed. The most gain per acre (185 lb) was obtained from a heavily stocked grazing system where the pastures were fertilized with 40 lb of N/ac and animals were sold in mid-summer. Continuous grazing for a 12-month period produced the least gain, 115 lb/acre.

A demonstration on overwintering bred cows on weeping lovegrass highlighted several potential problems. These include the loss of body condition, low weight calves at time of marketing and a delay in cow rebreeding.

The project successfully established woody plants for wildlife cover and annual wildlife food plots with minimal investments. A wildlife waterer (self-contained, walk-in drinker) provided a method of collecting and storing natural precipitation for wildlife use.

From an economic standpoint, results from this project indicate that neither reverting to crop production nor yearling stocker grazing will produce acceptable returns to land and risk. With typical levels of crop production, and no governmental price support programs, average returns to land and risk for dryland farm operations in Curry and Quay Counties would have been negative over the 1984-96 time period. Average returns to land and risk from grazing weeping lovegrass (with beef prices realized over the 1984-96 period) were estimated to be $2.54/ac under optimal production strategies. Actual net returns would have likely been less since after-the-fact knowledge about livestock prices (as used in the analysis) would not have been available to farmers at the time they were making production decisions.

Without CRP and crop subsidies, this study shows dryland farmers in the Southern Great Plains face an increasingly uncertain future. Cropping alternatives look dismal without crop subsidies, and grazing weeping lovegrass pasture does not provide a viable economic alternative. Without government intervention, land values should fall and marginal farming areas should revert to rangeland and natural vegetation. Although this process may lead to a more sustainable use of the land, many producers may be displaced in the process.

Potential Benefits or Impacts on Agriculture

This project has provided local producers with a wealth of information on the productive capacity of grasses currently growing on CRP land. In addition, this project developed economic models for comparing the economic profitability of converting CRP land to cropping or grazing. Until this project was completed, these types of unbiased comparisons were not possible. Unfortunately, the project results show the grazing of weeping lovegrass (one of the predominate grass species planted on CRP land in the Southern Great Plains) is not economically viable, nor is crop production, in the absence of government support programs. This project should serve as a wake-up call for producers and communities in this region that dryland farming as we know it is apparently not sustainable in a free market situation. Without additional government intervention, major market changes can be expected within the next decade.

Farmer Adoption and Direct Impact

Early results may have contributed to revised NRCS guidelines for establishment of vegetative cover on newly contracted CRP acreage. Thousands of acres of land in New Mexico and West Texas have been removed from the CRP since this project began. The grazing and tillage trials have provided producers with important information on cultural practices to renovate existing stands for grazing use or for converting standing cover to cropland production.

Although the economic analysis component of this project was only recently completed, a reduction in the number of producers who are considering using post-CRP lands for grazing purposes is anticipated. As discussions escalate toward the next major farm bill, results of this study should prove useful to legislators, commodity groups and others involved in developing farm and conservation legislation and policies affecting the Southern Great Plains.

Reactions from Farmers and Ranchers

Overall farmer reaction has been positive. Many producers have expressed support for the project. A number of farmers and ranchers expressed their surprise in the high rates of gain and stocking density that can be obtained from weeping lovegrass. Economic evaluations of stocker grazing have only recently been released. But, many farmers have apparently reached a similar conclusion about the economics of grazing weeping lovegrass pastures. Non-renewed CRP contracts in Curry and Quay counties are quickly being plowed out and put back into crop production. The wildlife component of the project has been well received and generated increased interest in tree and shrub plantings for wildlife and conservation purposes.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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SW94-006

Legume Cover Crops in Fallow as an Integrated Crop/Livestock Alternative in the Northern and Central Great Plains

Location:
Montana, Wyoming and Colorado

Funding Period:
July 1994 – December 1997

Grant Award:
$160,000

Project Coordinator:
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Cooperators:
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Leonard Fornstrom, Farmer, Pine Bluffs, WY
Francis Hruby, UW Res. and Ext. Ctr. Archer, Cheyenne, WY
Gilbert Lindstrom, Farmer, Sterling, CO
Miltenberger Brothers, Farmers, Stratton, CO
Marcel Solum, Farmer, Rudyard, MT

Objectives

1. Determine the feasibility of utilizing peas as the forage component to integrate livestock into the wheat/summer fallow cropping system (Wyoming).

2. Determine the efficiencies of water-use, biomass and N-fixation when incorporating peas into the wheat/corn/summer fallow cropping system (Colorado).

3. Determine adaptation, water-use, biomass and soil nitrogen contribution of late-summer seeded legumes in the dryland spring wheat or barley/summer fallow rotations (Montana).

4. Demonstrate the effectiveness of incorporating legumes into the agroecosystem through on-farm demonstrations, workshops, field tours and mass media for producers/extension/research and Soil Conservation Services personnel.

Abstract

In Wyoming, identical Austrian winter pea (AWP) rotation studies with winter wheat were started in 1994 and 1995. Wheat yield was obtained for all rotations (combinations of the two studies) in 1997. The grazed AWP/winter wheat rotation has shown rapid gains in wheat yield going from 19 percent less than the check in 1995 to 8 percent more than the fallow/wheat check in 1997. Additionally, in 1997 wheat grain protein content following grazed peas was numerically higher (1.7%) than wheat grain after fallow. In 1996, the wheat yield was lost to hail. In 1997, lambs grazed fall planted AWP for 21 days in June with a stocking rate of 11.9 lambs/acre. Average daily gain was 0.44 lbs/day. In 1998, lambs grazed fall planted AWP for 14 days in June with a stocking rate of 13.9 lambs/A. Average daily gain was 1.0 lbs/day. Forage available at the start of the grazing was 1,760 lb/A dry matter. Peas continued to grow producing 2,540 lb/A dry matter in the ungrazed exclosure. In the grazed pasture 1,097 lb/A of pea residue was left after grazing. Based on the data from these short-term rotations the net profit from the grazed AWP/winter wheat rotation is several fold greater than from the fallow/winter wheat rotations. With the exception of fallow and grazed AWP all treatments in the 1994 study succumbed to weed pressure. The weeds were the winter annuals downy brome and volunteer rye. The treatment impacted the greatest was continuous wheat. No yield was obtained from these treatments, instead plots were mowed and residue removed. It is encouraging that after three grazing cycles of AWP annual weed pressure appears to have diminished. An assessment of winter annual grassy weed populations in wheat plantings is planned for this autumn. These results must be interpreted with caution as these rotations will need to continue several more years for conclusive interpretation. Recent funding approval by USDA-SARE will allow this to happen.

Wheat-corn-fallow rotations were established at both Sterling and Stratton, Colorado in 1994. All phases of the rotation were present every year. We installed neutron access tubes in each experimental unit to keep a record of the soil water usage by the peas and the amount of water accumulated after pea harvest for the succeeding wheat crop. After corn harvest we experimented with growing peas in the fallow period after corn for cover, nitrogen (N) contribution, and livestock forage. Several scenarios were researched from 1995-1997. By 1997 we had determined that: (1) Austrian winter pea (AWP) planted no-till in the fall after corn harvest, and (2) spring field pea (SFP) and/or AWP planted no-till in the early spring following corn harvest were the most consistent alternatives. In all cases peas were allowed to grow until June, and at that point we removed differing amounts of the peas as forage.

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In Montana, all plot research was finished in 1996, therefore, no new field research was initiated in 1997. However the results from Moccasin and the grain protein results from Bozeman and Rudyard were not reported last year. Grain yield at Moccasin was unaffected by the green manure treatments when compared to a fallow check. These yield results were similar to those reported from Bozeman and Rudyard. As was mentioned in the 1996 report, drought conditions during June, July and August reduced expected yields. Grain protein content was not affected by the green manure treatments at Moccasin, Bozeman, or Rudyard. These protein results are similar to those reported last year at the Conrad location. Even though research plots funded by this grant were not reviewed by producers in 1997, they were shown other annual legume research trials at Conrad and Moccasin. Acreage of pea and lentil crops for seed, hay or green manure continues to grow in Montana. Pea and lentil acreage for all uses reported to the USDA-FSA increased from 30,844 acres in 1996 to 42,827 acres in 1997. Grower demand for information has continued to increase with the increased acreage.

Economic Analysis

In Montana, costs for green manure plantings vary with the year and species and should be compared to fallow costs. Thus the number of tillage or herbicide spray operations that the green manure crop replaces is an important factor. If the green manure is planted around July 1, then two or three tillage operations needed for conventional fallow would be eliminated, saving $10 to $15/A (assuming it costs $5/A for tillage). If a late-seeded green manure planting costs around $10 to $15/A and the effects of fallow and late-seeded green manure on the next crop are similar, the amount of N fixed would be "profit." The second crop following the green manure would be the beneficiary of the accumulated N, and its value would depend upon the price of fertilizer N (assume $0.20/lb of N; however, area N prices vary from $0.18 to $0.30/lb) and the efficiency of converting the organic N from the green manure to an available form (assume 50%). Thus N from the late-seeded green manure would be worth $4.50 to $15/A assuming green manure dry matter yields of 0.75 to 2.5 tons/A and a N content of 3 percent.

In Wyoming, based on the data from the short-term rotations, the net profit from the grazed AWP/winter wheat rotation is several fold greater than from the fallow/winter wheat rotations. Over the four years (1995-98) an average of 160 lbs/acre in total lamb gain was realized, with no bloating problems. At $0.75/lb this was a gross income of $120.32/A.

Potential Benefits

Planting legumes in mid to late season in Montana to replace summer fallow can reduce annual soil erosion losses from 4 to 6 tons/A, increase precipitation efficiency from 20 to 50 percent, prevent excessive precipitation from forming saline seep, and eventually reduce fertilizer N costs from $4 to $15/A.

In Colorado, legumes in the wheat-corn-fallow rotation would provide diversity for weed control purposes, provide extra cover during fallow, and provide a high quality forage for livestock. Unfortunately our data have shown that the Austrian Winter Pea and spring field pea are not economically feasible in this system. Wheat yields are depressed after peas and input costs for the pea crop are high.

In Wyoming, grazed Austrian Winter Pea in place of fallow also provides diversity for weed control purposes, provides extra cover during fallow, and provides a high quality forage for livestock. Net return from grazing was positive. A detailed economic analysis will be possible thanks to recent funding approval by USDA-SARE.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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SW94-008

Fall-Planted Cover Crops in Western Washington: A Model for Sustainability Assessment

Location:
Washington

Funding Period:
July 1994 – October 1998

Grant Award:
$80,000

Project Coordinator:
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Cooperators:
Douglas Bulthuis, Scientist, Padilla Bay National Estuarine Research Reserve, Mount Vernon

(continued)

Objectives

1. Determine the biological and socio-economic value of fall-planted cover crops with regard to nitrogen conservation and wildlife habitat enhancement.

2. Encourage adoption of cover crop practices by farmers through increased farmer-to-farmer responsibility for education and applied research.

3. Increase the understanding and appreciation of the value of fall-planted cover crops among members of the non-farming public.

4. Develop and test new mechanisms for strengthening partnerships between the agricultural community and environmental groups.

Abstract

Cooperators from the Skagit Valley were recruited to test the value of nitrogen recovered from fall-planted cover crops which were incorporated in the spring. The on-farm experiment was based on research conducted at the WSU Mount Vernon Research Unit which showed that cover crops planted in early September could accumulate up to 150 pounds of nitrogen per acre. This research also indicated that when cover crops were incorporated into the soil in the spring, nitrogen concentrations in the soil increased in May and June. Cash crops used in the on-farm experiment were cucumbers and potatoes.

Volunteers interested in natural resource conservation worked with WSU staff to determine how winter field cover influences bird habitat. An informal survey was developed, and the volunteers interviewed farmers and expert bird watchers. In addition to gathering information about cover crops and bird habitat, the interviews yielded significant information as to how farmers and non-farmers might increase communication and understanding through cooperating on wildlife habitat issues of mutual concern. A fact sheet discussing the findings of the interviews is in the process of publication.

An educational video was produced to educate selected non-farm audiences about farmers' environmental stewardship efforts, and the value of cover cropped fields to wildlife and to the community. The video will also be used to motivate crop producers to add fall-planted cover crops to their management systems. Experiences and attitudes of farmers and environmentally-concerned citizens about fall-planted cover crops are an integral part of the message. Recently completed, the video has been reviewed by two groups who were very enthusiastic about its usefulness.

In a preliminary phase of the video development, approximately thirty interviews were conducted to gather insights about farmer and non-farmer attitudes, experiences and perceptions concerning agricultural stewardship. The Skagit Community Agriculture Study yielded significant information about how farmers and non-farmers view each other, and how they view the future of agriculture in the Skagit Valley. Interviewees were selected from this pool to participate in video taped interviews. Preparation of a fact sheet is in process to present the findings and conclusions of the Skagit Community Agriculture Study.

Skagit County government contributed funds for the production of two other educational videos. One, for home gardeners, discusses gardening and landscaping practices that protect water quality. The other, for small acreage farmers with livestock, discusses best management practices related to stream bank, manure and mud management.

Lorna Michael Butler, Agricultural Anthropologist, WSU Puyallup Research and Extension Center, Puyallup

Woody Deryckx, Field Representative, Cascadian Farm Inc., Concrete

Mike Hulbert, Field Representative, Wilbur Ellis Company, Mount Vernon

Ed Knight, Business Manager and Representative for Washington Environmental Council, Swinomish Tribal Community, LaConner

Ron Knutzen, Farmer, Knutzen Farm, Bow

George McFadden, Regional Silviculturist, WA State Dept. of Natural Resources, Sedro-Woolley

Keith Morrison, Farmer, Morrison Farms, Mount Vernon

Steve Nissley, Engineer, U.S. Soil Conservation Service, Mount Vernon

John Roozen, Farmer, Washington Bulb Company Inc., Mount Vernon

Ken Willis, Department Head, Skagit County Environmental Health Department, Mount Vernon

Jerry Van der Veen, Dairyman, Van der Veen Dairy Farm, Mount Vernon

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David Hughes, Hughes Farms, Mount Vernon

Bob Rose, Skagitonians To Preserve Farmland, Mount Vernon

Richard Smith, Smith Farms, Mount Vernon

Gail Thulen, Thulen Farms, La Conner

In order to promote public understanding of the role of agriculture in environmental stewardship, the Skagit Valley Tulip Festival's 1997 brochure contained a section titled "Cooperative Efforts By Farmers To Enhance The Environment." Over 300,000 copies of the brochure were distributed to festival attendees from throughout the Pacific Northwest.

A fifteen-member focus group, involved in previous research and education on nitrate leaching, helped develop the objectives of this grant and the on-farm experiment design. The group continues their informal involvement, for example by reviewing and guiding the direction of a new project aimed at enhancing communication and understanding between the farm and non-farm sectors in the community.

An Ag/Environment Group, consisting of some of the original nitrate leaching focus group members, was formed in early 1996. This group is exploring ways to strengthen partnerships between the agricultural community, consumers and environmental interest groups in the Skagit Valley. The group is made up of farmers, representatives from environmental and farmland preservation organizations, and university research and extension personnel. The group expressed a need for more insight into the attitudes and perceptions that Skagit Valley farm and non-farm communities have about each other. The Skagit County Community Agriculture Study was one outcome.

A new WSU research and education facility is being planned for Mount Vernon. Research and extension faculty and the public are jointly exploring how the facility might foster improved communication and collaboration between the agricultural community and environmental, consumer and other non-farm groups.

Economic Analysis

In order to determine the cost to farmers of establishing and managing fall-planted cover crops, farmers monitored the cost of seed, and the cost of their time and equipment for ground preparation and planting, and for incorporating cover crops in the spring. The cost of establishing cover crops in the Skagit Valley averages about $40 per acre. Five farmers participated in the study. Each planted three cover crops that are frequently used in this area—cereal rye, white oats and winter wheat.

On a one year basis, this research did not find evidence that cover crop incorporated in the spring reduced the amount of fertilizer inputs needed for vegetable crops. Informal farmer discussion based on long term experience, and the findings of the Skagit Community Agriculture Study, provide evidence that refutes this finding. Farmers who have used cover crops for many years attest to the long term value of investing in cover crops.

Farmer Adoption and Direct Impact

Some farmers have reduced nitrogen fertilizer rates for potatoes, resulting in reduced risk of negative environmental impacts from excess nitrogen fertilizer and reduced production costs.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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SW94-029

Development and Demonstration of Integrated Vegetable Production Systems for the Maritime Pacific Northwest

Location:
Oregon and Washington

Funding Period:
July 1994 – December 1997

Grant Award:
$80,000

Project Contact:
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Dick Strunk, Northwest Farm Tillers, Yakima, WA
Keith Grover, Salem
Dale Lucht, Crestview Farms, Molalla
Mike Calef, Madjic Farms, Independence
Roger Hamlin, Hamlin Farms, Corvallis
Peter Kenagy, Kenagy Family Farms, Albany
Frank Fery, Aumsville

Objectives

1. To develop, evaluate and demonstrate integrated vegetable production systems for the maritime Pacific Northwest which improve farm profitability, protect water quality, and enhance long-term soil productivity.

2. To improve methodologies for enhancing farmer and agribusiness participation in the design and implementation of on-farm research and demonstration projects for integrated, sustainable agriculture.

3. To conduct a multi-faceted educational program which accelerates information transfer among producers, extension specialists and agents, agribusiness representatives, governmental agency personnel, and the university research community.

Abstract

This participatory on-farm project has actively involved vegetable growers in the design and implementation of the research. Learning and discovery has occurred at multiple levels through direct observation, farmer-scientist focus sessions, grower-led field days, workshops, and farm tours. This project has focused in three critical components of integrated farming systems: (1) selection and management of winter-annual cover crops to enhance soil and water quality, (2) development and implementation of a strip-tillage production system, and (3) evaluation of beneficial insectary plantings to enhance biological pest control.

This project has focused on developing and evaluating strip-tillage vegetable production systems which integrate winter-annual cover crops for enhancing soil and water quality, suppressing weeds, and providing a habitat for beneficial organisms. In five on-farm trials in 1997 involving sweet corn production in Oregon's Willamette Valley, an integrated strip-till production system increased economic net return by an average of $47 an acre compared to the conventional tillage system. In one farm, herbicide costs were reduced by $17.53 per acre. In a replicated trial conducted at the OSU Vegetable Research Farm, strip-till systems for broccoli production using legume cover crops produced a yield increase of approximately 2 tons per acre compared to the conventionally-tilled system. In a two-year on-farm trial involving cover crops for nitrogen contribution, the use of legume cover crops reduced fertilizer nitrogen (N) inputs by 60 lbs N/acre and the participating grower reduced his fertilizer applications on approximately 600 acres.

In another on-farm research trial exploring the use of beneficial insectary flowers to increase the abundance of predatory insects, experimental plots using the insectary plant *Alyssum maritima* showing a significant increase in predacious syrphid flies caught in traps and in number of syrphid eggs laid on broccoli leaves. Parasitism of the cabbage aphid was doubled in the alyssum plots.

The integrated vegetable production system developed in this project offers potential to increase net profit to the growers, improve water quality through reduction of leaching and surface runoff, and enhance soil quality through conservation of soil organic matter and biological diversity. There is also a proven potential to reduce pesticides and fertilizer inputs. This system is being adopted by leading vegetable producers in the Willamette Valley, with more than 500 acres to be planted to integrated strip-till in 1999.

Twilight cover crop twilight tours were hosted by two collaborating growers in 1995, and a mid-summer "Conservation Tillage/Cover Crop Field Day" was held at the OSU Vegetable Research Farm. Two field tours were held in 1996. Presentations of research findings were made at the Oregon Processed Vegetable Growers annual meeting, the Oregon Horticultural Society Meeting, Agronomy Society of America Na-

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tional Meeting, and at two in-service professional education workshops held in conjunction with SARE Program Chapter 3 activities in the Pacific Northwest.

Economic Analysis

An economic evaluation of the costs of cover crop production, based on individual grower records, has shown the variable costs to vary from $35-50/acre, including tillage operations. Efforts to determine N contribution by cover crops has been targeted at recouping the cost of 80-100 pounds of N fertilizer, worth approximately $25-35 per acre. The primary motivating factors for growing cover crops, according to collaborating growers in this project, is to improve soil quality and help reduce nitrate leaching. The economic value of these kinds of qualitative benefits has not yet been estimated

A comparison of the relative economic benefit of the strip-till system compared to the standard tillage systems was conducted using two components: (1) economic value of the crop (yield, grade and price) and (2) calculating costs of tillage for the two systems. Tillage costs were estimated using *The Cost of Owning and Operating Farm Machinery in the Pacific Northwest* (Willett and Smathers, 1992) and information on specific equipment used by the collaborating growers.

The strip-tillage system produced higher sweet corn yields than the standard tillage practices on 4 of the 5 fields in the trial. Economic analysis showed that for sweet corn production averaged across the three farms and five fields in the 1997 trial, the strip-tillage system produced an economic advantage of $47 per acre greater than the standard tillage systems. This value is based on an average increase in crop value (a combination of yield, grade and price) of $27 per acre and an estimated savings in tillage costs of $20 per acre. The highest increase in economic value associated with strip-tillage was in the Hendricks Farms Shelburn Road field, with a $126 advantage over standard tillage ($98 in product value; $27 in tillage cost savings).

Potential Benefits

Strip-tillage systems for sweet corn production using cover crops were shown to be more profitable than conventional tillage treatments in on-farm trials conducted in 1997. There is the potential to dramatically reduce tillage requirements by 500 to 700 percent. This reduction in tillage will reduce soil erosion and movement of soil and agricultural chemicals into surface water systems through runoff. There is also a dramatic reduction in wind erosion of soil through this conservation tillage system. A major impact associated with adoption of these conservation tillage systems could also be improved conservation of soil organic matter by reducing microbial oxidation following tillage.

Fall-planted winter annual cover crop mixtures of cereals and legumes can significantly reduce soil erosion and leaching of soil nitrate into the groundwater during the rainy Pacific Northwest winters. These cover crops, when managed correctly, can reduce nitrogen fertilizer requirements for the following vegetable crop by 80-100 lbs. N/acre.

Allelopathic cover crops, coupled with reduced tillage systems, form important components of integrated weed management strategies, with dramatic opportunities to reduce herbicide inputs and costs. Beneficial insectary plantings offer promise in increasing the effectiveness of naturally-occurring predacious and parasitic insects in biological insect pest management. We are developing strategies and specific management recommendations to utilize beneficial insectary plants in both annual and perennial cropping systems. These strategies, combined with other integrated pest management tactics, may reduce pesticide inputs into these systems.

Farmer Adoption and Direct Impact

There is an increasing number of vegetable growers in the Willamette Valley who are growing cover crops, largely due to on-farm demonstration tours and other educational events associated with this project. Changes in cover crop practices are also occurring. For example, Stahlbush Island Farms, a 1,400 acre vegetable production operation near Corvallis, switched from growing Austrian field pea cover crops to using fava beans, crimson clover, and common vetch as direct result of being involved with this project. Several of the growers involved with the on-farm strip-till evaluation expanded the acreage on their farms planted using the strip-till system in 1998 and will be planting more than 500 acres in 1999 using the strip-till system. The equipment manufacturer collaborating on this project (Northwest Farm Tillers, Yakima, WA) has committed significant financial resources to completely redesigning their strip-till machine to accommodate the needs of the growers in our project.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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SW95-012

A Cover Crop System for Sustainable Grape Production in California—Beyond the Transition Phase

Location:
California

Funding Period:
July 1995 – December 1997

Grant Award:
$122,559

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Daniel Bosch, Vineyard Technical Advisor, Robert Mondavi Family of Wineries, Oakville
George Leavitt, Farm Advisor-Viticulture, UC Cooperative Extension (UCCE), Madera
Jon Marthedal, Farmer, Fowler
Tim Prather, Regional IPM Advisor-Vegetation Management, Kearney Ag Center, Parlier

(continued)

Objectives

1. Compare the impact of a legume grass cover crop system on weed abundance in row middles and vine berms; and its value as a substitute for soil applied herbicides.

2. Determine the impact of this cover crop system, on soil fertility and vine nutritional status, and its value as a substitute for synthetic chemical fertilizers.

3. In a separate experiment, compare the impact on soil fertility and vine nutritional status by early and late plow-down of the legume-grass cover crop; and its value as a substitute for synthetic chemical fertilizers.

4. Determine the role of the cover crop systems, described in objectives 1 and 3, in the natural control of leafhoppers and spider mites, and their role in reducing the use of insecticides and miticides.

5. Determine the effects of the cover crop systems, described in objectives 1 and 3, on soil and vine water status, and their potential impact on water use.

6. Determine the effects of the cover crop systems, described in objectives 1 and 3, on vine growth and development, and grape yield and quality.

7. Determine the costs and benefits of the cover crop systems, described in objectives 1 and 3, in terms of overall chemical inputs, yield, labor requirements and farm profitability.

8. Develop guidelines and integrated demonstrations of cover crop systems in vineyards for insects and mites, weeds, vine-nutrition management, and water demand.

Abstract

This report describes the results of a project evaluating the long term impact of several cover-crop based vegetation management systems on weeds, vine nutrition, water use, insect pests, plant parasitic nematodes, and grape yield and quality in California wine grape and raisin grape vineyards. Our findings to date indicate that rye-vetch or oat-vetch cover crops can have a substantial but variable impact on several elements of grape production. The impact depended largely on cover crop management, water use, and vineyard age. Where the cover crop was used as dry mulch for weed control in the vine rows, weed populations were maintained at acceptable levels with mulch and one late winter application of postemergence herbicides. By the fourth year (1996), mulch in vine rows in combination with postemergence herbicides reduced the cumulative negative effect of summer weeds on grape yield and quality in bare and non-mulched plots that had been treated only with postemergence herbicides. To maintain vines at similar water status, the mulch (Kearney I) and reseed systems (Madera vineyard where cover crop not used as mulch but plowed down at senescence) utilized approximately 30 percent more irrigation water than the clean-cultivated or green-manure (Madera vineyard where cover crop plowed down in April) systems. The mulch system provided the greatest relative increase in soil fertility, soil microbial biomass, and vine nitrogen levels compared with the clean-cultivated system. The green manure and reseed systems maintained vine nitrogen at levels similar to a clean-cultivated system that received a fall-application of compost; but the reseed system resulted in slightly improved grape yield and

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Lucia Varela, North Coast IPM Advisor-Entomology, UCCE, Santa Rosa
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quality. Water and nutrient stresses occurred in the reseed system in a young vineyard (Napa) when supplemental water was not provided to the vines.

Densities of leafhopper pests depended on cover crop management and vineyard age and their resulting impact on spider abundance and vine water and nitrogen. In the 'young' Kearney I vineyard, leafhopper problems were exacerbated at the end of the season in two out of four years in the cover crop and mulch system, primarily due to higher nitrogen levels and low resident spider populations. In contrast, a reseed system of rye and vetch (without added nitrogen) maintained vine nitrogen at similar levels to a clean-cultivated system (but higher than a rye alone system), but resulted in substantially higher spider densities and lower leafhopper densities than in the clean-cultivated plots. We have previously determined that a spider assemblage similar to that found in the Madera and Kearney II vineyards can cause significant reductions in leafhopper abundance.

The effects of vegetation management on operating costs represented a trade-off in water, fertilizer, pesticide and resource use. The use of cover crops (despite greater water demand) significantly reduced operating costs where savings were realized by reducing chemical (pesticide, herbicide, and nitrogen fertilizer) inputs. These savings were greatest where the use of cover crops (primarily as reseed with and without mulch) increased grape yield and/or quality. Savings may also increase if we were to include the potential costs where environmental contamination or increased health risk to humans and wildlife are likely to occur as a result of the use of selected pesticides, herbicides and synthetic fertilizers.

Finally, dissemination of our findings has apparently resulted in increased interest and adoption of cover crops in grape production in California. Information developed from our studies is being disseminated to both the academic community and farmers through reports and meetings. All of the major participants in this project regularly participate in industry training programs for farmers. In addition, we are co-authors of the University of California's Pest Management Guidelines for Grapes, and have authored sections of the University's Grape Pest Management manuals. Quantifiable results obtained through these studies will be incorporated into the guidelines.

Potential Benefits

Our research provided practical benefits to several aspects of grape production including insect, weed, and nutrition management. Our findings also contributed to the general understanding of the feasibility of developing and implementing sustainable crop previously observed higher levels of leafhoppers in association with reseed rye-vetch systems.

In addition, our research demonstrated for the first time that extrafloral nectar-bearing plants in the vineyard floor can be used to exclude ants from the grape mealybug-infested vine canopy, in turn improving biological control of the grape mealybug. These results have broad implications for crops that are infested with honeydew-producing insects (e.g., aphids, scales and mealybugs) and are attended by ants which can potentially disrupt biological control of the honeydew producing insects. Providing ants with alternative resources on the extrafloral nectar-bearing plants may be used as non-chemical alternative to ant exclusion and control on many crops infested with honeydew producing insects.

Our research has shown that if managed properly cover crops can directly and indirectly reduce pest and weed densities, and (potentially) minimize the use of insecticides and herbicides, in turn resulting in significant reductions in operating costs.

Farmer Adoption and Direct Impact

Perhaps the greatest contribution of our on-farm research has been the willingness of growers to take greater risks and reduce pesticide usage on their farm. This is clearly indicated in the testimonials of the cooperating growers. The growers have also been closely involved in the design of our cover crop system. We have made every available effort to modify the design to facilitate the adoption of this system under various management conditions. Preparation of seed bed, timing of planting, and irrigation practices have been some of the elements that were modified for the various farms used in our studies. Most importantly, our research has helped our cooperating farmers to adapt farming practices that incorporate cover crops in the management of their vineyards. Their adoption of this practice has also encouraged others to do the same.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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SW95-019

Development of a Farm-Wide System for Control of Many of the Principle Lepidopterous Pests of Grapes and Tree Fruits Based on Disruption of Premating Pheromone Communication Between Male and Female Moths

Location:
San Joaquin Valley, California

Funding Period:
July 1995 – December 1998

Grant Award:
$120,770

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Richard L. Coviello, UC Farm Advisor, Fresno County, Fresno

Cooperators:
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Jocelyn Millar, Dept. of Entomology, UCR
Kent Daane, Biological Control Specialist, UC Berkeley
Scott Johnson, Pomology Specialist, UC Davis (UCD)
Pete Christensen, Cooperative Extension Viticulture Specialist, UCD
Harry Andris, UC Farm Advisor, Fresno County, Fresno

Objectives

1. Establish laboratory colonies for each Lepidoptera species to be tested.

2. Determine for each species the critical concentration of pheromone components needed to effectively disrupt premating communication of the following major lepidopterous pests of California stone fruit and grapes: Oriental fruitmoth (OFM), peach twigborer (PTB), omnivorous leafroller (OLR), raisin moth (RM), oblique-banded leafroller (OBLR) and orange tortrix (OT).

3. Perform quantitative analysis of various pheromone components, both alone and in mixtures to determine chemical stabilities in the absence of air, and volatilities when exposed to air.

4. Determine for each species the degree to which their specific pheromone components, presented separately or in mixtures, either enhance or interfere with the efficacy of communication disruption of other species when they are simultaneously exposed to marginally disruptive levels of their own pheromone components.

5. Demonstrate that appropriate combinations of the pheromone components representing each of the lepidopterous pests present in specified 160-acre blocks of grapes or stone fruit can be released together into the air from widely separated mechanical dispensers spaced on _-mile grids, providing effective communication disruption of each of the species.

6. Determine and demonstrate the efficacy of this ranch-wide communication disruption system, when it is maintained in 160-acre blocks through the entire effective pest season, by comparing reductions in larval infestations attacking the crop foliage, fruit and stems with reductions that are caused in comparison blocks by presently available commercial pheromone-disruption systems or by presently recommended pesticidal control methods.

7. Measure the edge effect of larval infestation of the respective pests that is caused by female moths that mate in nearby untreated areas and then fly into and lay eggs in the pheromone-protected area.

8. Arrange field days at the 160-acre treated ranches and publish results in newsletters and appropriate agricultural publications to inform interested growers, farm advisors, PCAs, and regulatory personnel at both state and federal levels with regard to the new technology.

Abstract

A novel device for dispensing pheromones into the air of agricultural fields, for the purpose of communication disruption and elimination of mating of pest moth species, is the puffer. These machines release repeated puffs of pheromone from pressurized aerosol cans, with individual puffs often containing pheromone equivalent to millions of female moths. They have a number of advantages, in comparison to traditional hand-applied pheromone-release devices. Because the pheromone is protected from light and oxygen until the moment of release, chemical breakdown is minimized. Two or more pheromones can be mixed and emitted together, giving the opportunity to obtain simultaneous control of more than one species. The amount of pheromone is the same for the last puff as it is for the first puff released from the can, giving a predictable amount of pheromone delivered per unit of time. Labor costs for installing puffers are apt to be considerably lower than they are for hand-applied devices.

Nine large-acreage, season long trials were conducted during 1996, 1997 and 1998 to evaluate the puffer technique for management of lepidopterous pests on peaches and table grapes. Four trials on peaches were directed at simultaneous mating disruption and control of the oriental fruitmoth, omnivouous leafroller and the peach twigborer. Five trials on table grapes were directed at mating disruption of the omnivouous leafroller and raisin moth. In these trials, puffers showed high potential for controlling multiple pest species on a wide area, farm-wide basis.

Our work to date has been directed toward determining optimum pheromone blends and quantities that are needed in order to disrupt premating pheromone communication of OLR, OFM and PTB in peaches and OLR, OT and RM in table grapes. Early research phases were conducted in field plots with miniature pheromone evaporators. These were arrayed in 6 x 6-evaporator grids and separations between evaporators were varied to determine which combinations of these chemicals were best at preventing male moths from locating virgin females and synthetic lure bated traps.

In separate tests, we have evaluated the Sentry (formerly Ecogen) "coil" formulated for OLR, OT, PTB, OFM and RM pheromones when applied in vineyards and orchards at the rate of 130 and 260 coils per acre. Each application provided a total of 6.5 or 13 grams pheromone for the season. The OLR and OT provided effective communication disruption for these species for 120 days. OFM provided disruption for 60 days and PTB and RM both disrupted communication for 30 days at best.

A large amount of cross disruption of communication is encountered among the three leafroller species, OLR, OT and OBLR reflecting certain pheromone components that are identical in the pheromone blends of each of these species. This cross disruption of leafroller species stimulates our continued investigation into a possible generic pheromone blend for all leafroller species. No evidence for a lessening of communication disruption in any target species through simultaneous exposure to the pheromones has been detected.

We sample for larvae infestation to fruit in transects, with sampling rows extending from border to border through the center of the field. Through the use of this technique we have estimated that penetration of OLR mated females into a puffer treated block is only 20 meters. However our failure to disrupt OLR mating in the 40-acre block in 1997 and RM indicates some conditions moths of these species may penetrate into orchards and vineyards. After a more detailed literature search of RM pheromone it was discovered the total RM pheromone complex has never been fully researched. We have discussed this finding with other researchers and interested commodity groups who are in the process of finding the correct pheromone complex.

We have been interviewed on 17 occasions by farm magazines and newspapers, one radio station and one television station in 1996, 1997 and 1998. The stories have raised interest in growers about puffers and their potential use in moth communication disruption. We have participated in fourteen grower-oriented conferences to an audience of over 1,000 growers, PCA's and regulatory people.

Economic Analysis

Ultimately puffers will be comparable to or less expensive than other means of disseminating pheromones in orchards and vineyards. Individual puffers will cost $40 and will last 5 years. Because puffers are used at great separations in the field the cost of placement and maintenance is low. One man can place puffers around a 40-acre block in about three hours. The major expense will be the pheromone chemicals, which the price will be reduced as the usage is increased.

Potential Benefits

At the end of the three-year project the system is ready for a limited commercialization with a doubling of potential users each year. As registrations become available and use increases the ultimate cost of this system will decrease.

Because Lepidoptera often represent the key pests of a crop, the ability to withhold hard pesticides applications has obvious benefits. Fewer broad-spectrum pesticides treatments enable the establishment of biological controls and free the grower from reliance on pesticides. With fewer pesticide treatments a resurgence of beneficial insects is likely and pesticide resistance is reduced. The implementation of a puffer pheromone disruption system can reduce two or three pesticide applications of Imidan and Lannate each year.

Farmer Adoption and Direct Impact

Registration for the pheromone chemicals to be used in puffers has been applied for. Once the chemicals are registered as pheromone by their manufactures then the chemicals can be registered for use in the aerosol puffer system. For some of these chemicals it may be the year 2000 or later.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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AW95-103

Orchard Alley Cropping in the Subhumid Tropics

Location:
Hawaii

Funding Period:
July 1995 – December 1998

Grant Award:
$30,430

Project Coordinator:
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Cooperators:
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Steve Skipper, NRCS District Conservationist

Objectives

1. Establish contour hedgerows in an approximately 1.5 acre tropical fruit orchard in the subhumid tropics.
2. Measure hedgerow prunings fresh weight and nutrient concentrations for two NFT species at each cutting, in order to ascertain fertilizer replacement values.
3. Measure soil nutrient levels on an annual basis and crop growth on a semi-annual basis for each of six treatments and a control.
4. Measure fluctuation of soil levels on an annual basis.
5. Demonstrate the orchard alley cropping system, and present two workshops for farmers, ranchers, extension agents and agricultural consultants.
6. Determine economic costs and returns of orchard alley cropping.

Abstract

This project, located on a farm in Holualoa, Hawaii, studied alley cropping for mulch production in a fruit tree orchard. In alley cropping, fast growing nitrogen-fixing trees (NFTs) are grown in contour hedgerows alternated with crops to provide an abundant source of nutrient-rich organic matter which is applied to the soil as mulch. By cycling nutrients in the agricultural system, alley cropping in an orchard setting holds promise for greatly reducing, and possibly eliminating, the need for manufactured or imported fertilizer inputs, replacing them with an on-site organic source of fertility.

Research focused primarily on the ability of the alley cropping technique to provide sufficient nutrients to tree crops, as well as the economic feasibility of the practice for orchards. The two NFT species were *Acacia angustissima* and *Calliandra calothyrsus*; the fruit tree crop was Jackfruit (*Artocarpus heterophyllus*).

The hedgerows were pruned for mulch four times during the project. Hedgerow prunings fresh weight and nutrient concentrations for the two NFT species were measured at each cutting, in order to ascertain fertilizer replacement values. Data show that the hedgerows produced about 300 pounds of mulch per fruit tree per year. Nutrients from this mulch source provided the nutrient equivalent to over 500 pounds of chemical fertilizer per acre per year, potentially replacing 400 pounds of urea, 25 pounds of treble super phosphate, and 120 pounds of muriate of potash. Soil analysis showed significant increases in total nitrogen and potassium as a result of the practice. Soil pH also improved, becoming more neutral. The mulch also reduced the need for weed control around the crop trees and conserved soil moisture. The health and vigor of the mulched crop trees visibly surpasses that of unmulched trees, and analysis of the data shows a trend of faster growth and larger stem diameter in the mulched trees over unmulched. The costs of this practice are roughly equivalent to using purchased mulched materials. This practice may be particularly of benefit to cash-poor Pacific Island farmers, who have better access to labor than cash.

Since the beginning of this project in August 1995, three workshops for farmers have been held at the site, as well as three field days, with a total of over 180 people having visited the project. Participants in workshops and field days were generally a mix of farmers, orchard managers, extension agents, and other agricultural professionals. One field day was targeted specifically to the interests of resource-poor growers from the Hawaiian Homelands, and displaced sugar cane workers. In addition, the practice has been shared in slide

presentations for two grower groups, the Hawaii Tropical Fruit Growers Association and the Kona Outdoor Circle, with over 70 attendees. At least fourteen farmers are known to have integrated nitrogen fixing trees in their farms directly as a direct result of their participation in a workshop, field day, or evening lecture.

The two booklets produced, the *Nitrogen Fixing Tree Start-Up Guide* and *A Guide to Orchard Alley Cropping,* summarize practical recommendations for farmers who wish to plan for, install, and manage an orchard alley cropping project. Both booklets are being distributed to Hawaii and American-affiliated Pacific Island Cooperative Extension and Natural Resource Conservation Service offices. Free reproduction for educational purposes is encouraged. Booklets will also be made available in pdf format to be downloaded free of charge from the web site http://www.agroforester.com.

Economic Analysis

The costs for orchard alley cropping are approximately $2,000 per year, with over 90 percent of that cost being labor (calculated at $10/hour) to cut the hedgerows and use the mulch. Clearly this is a labor intensive practice, which demands very little capital or monetary expense if labor is not purchased.

For the purposes of comparison, commercial alfalfa hay purchased from a Hawaii distributor was used. Like the hedgerow mulch, it is generally free of weed seed, easy to apply as mulch, and has a similar nutrient composition. Using the hay for mulch would cost about $1,900 for a similar quantity of material as that produced by the hedgerows. About 80 percent of this cost is in money spent for the mulch material, and about 20 percent for labor.

The benefit-cost analysis shows that for our comparison there is a negative marginal rate of return for the alley cropping method of producing mulch of 6 percent annually, as compared to purchasing mulch.

Considering that most small farmers have limited capital to fertilize and maintain their orchards, the alley cropping method of mulch production, which relies on little outlay of capital, would be preferred. Alley cropping also gives other farm benefits including erosion control, wind shelter and farm self-sufficiency, which have not been given values in the economic analysis.

Potential Benefits

This project highlights the importance of organic matter in tropical agriculture, and in so doing stimulates the use of organic and sustainable techniques. Adoption of the orchard alley cropping practice holds great potential to reduce farmer dependence on purchased chemical fertilizers, reduce environmental pollution from chemical fertilizers and weed control, reduce erosion, and increase overall soil health, while allowing continued levels of fruit crop production. This practice produced approximately 20,000 pounds of mulch per acre per year, or about 300 pounds of mulch per crop tree. Cycling nutrients in the agricultural system mimics the production of organic matter in tropical forests, and improves soil life and crop health. The nutrients from the on-site mulch source provided the equivalent to over 500 pounds of chemical fertilizer per acre per year, equivalent to 400 pounds of urea, 25 pounds of treble super phosphate, and 120 pounds of muriate of potash.

Benefits of this system to the farmer include: an abundant on-site source of nutrient-rich organic material for use as mulch and slow-acting fertilizer; soil building through accumulation of organic matter through mulch; erosion control; reduced weed control labor; other products for the farm such as supplementary fodder and fuelwood; and an opportunity to replace expensive fertilizer imports with an on-farm source obtainable with labor.

Potential environmental benefits of this practice include: the reduction or elimination of soluble fertilizers, reducing soil and water contamination; soil conservation through the creation of erosion barriers; reduction of fossil-fuel pollution from transportation of chemical and/or organic fertilizers, particularly to the remote Pacific Islands; and potential reduction of herbicides through mulch weed control.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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AW94-010

Management of an On-Farm Composting System

Location:
Utah

Funding Period:
July 1994 – December 1996

Grant Award:
$30,000

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Objectives

1. Determine the fate of nutrients in an on-farm composting management system.

2. Develop a management plan to optimize the value of the composted end-product.

3. Demonstrate the management system to local producers.

4. Distribute information through the Cooperative Extension Service.

5. Analyze the economic and labor requirements of the management system.

Abstract

Experiments were conducted at Utah State University in Logan, Utah, from the fall of 1993 to the winter of 1994 to evaluate the feasibility of composting in a cold, arid climate. The windrow method of composting was used on an outside composting pad. Composting appears feasible in a cold, arid climate. However, turning may not be feasible if water cannot be applied to the compost windrows to maintain proper windrow moisture content (between 40 and 60%). There was a significant difference in most of the elements tested between the raw materials and the ending compost. Soluble salts, phosphorous (P), and potassium (K) levels were high in soils under the intense management regimes. A concrete or asphalt pad to prevent leaching and improve access to the composting site may be beneficial for producers to consider. Results will be useful in facilitating on-farm composting as a dairy waste management practice in northern Utah and more generally, the Intermountain West.

Characteristics of compost at the beginning and ending of the treatments [(1) no turning/no water, (2) no turning/water, (3) turning/no water, and (4) turning/water] were analyzed for NO_3-N, P, K, and soluble salts using an ANOVA for a randomized complete block design.

Concentrations of soluble salt increased during composting in all treatments during the spring and summer of 1994 ($p = 0.05$). Phosphorous concentrations decreased significantly in all treatments ($p = 0.05$) during the spring and summer of 1994. In the fall of 1993, potassium levels generally decreased, especially in the no turning windrows. There were significant ($p = 0.05$) decreases in all treatments during the fall of 1993 and for treatments 3 and 4 for spring of 1994 ($p = 0.05$), and treatment 1 for summer of 1994 ($p = 0.05$). No significant statistical differences were observed in any of the treatments for nitrate for fall of 1993 and spring of 1994. Nitrate levels increased in treatments 1 and 2 during the summer of 1994 ($p = 0.05$).

Composting in a cold, arid climate such as northern Utah appears feasible with moisture as a limiting factor. The cold, arid climate of the Intermountain West provides a wide range of environmental conditions, which producers must consider when managing compost. In the spring, animal wastes are high in moisture content (>80%), and considerable amounts of drier materials must be added to lower the moisture level for proper composting. Also, wetter materials must be turned more frequently than normal to facilitate drying. During the summer months when water is limited, windrows should be turned when evaporative losses are low (at night, or after a rain event). However, water must be added during the summer and windrows must be turned frequently to reach the high temperatures required to destroy weed seeds. Methods to minimize moisture loss may need to be developed during the summer months. Covering windrows with a compost windrow fabric may be one such method to help conserve moisture

during the summer months. In the fall of the year when there is usually more precipitation, evaporative losses are less of a concern. Evaporative losses are also less of a concern during the winter. We did not determine the extra time needed to compost materials if additional water was not added. The relationship between composting and moisture management warrants additional study.

Two key elements that do not receive much attention when managing soils are phosphorous and potassium. Potassium requirements of plants are high during early stages of growth, and it is important to provide adequate (but not excessive) amounts. Compost contains relatively large amounts of potassium and should be applied on the basis of soil tests. Heavy applications of compost may exceed plant requirements of phosphorous and potassium may lead to other problems in the soil or future crops. Perhaps smaller split applications may be warranted to avoid excesses of phosphorous and potassium, which may dictate management more than nitrogen.

Soluble salt concentrations in the compost were as high as 34 mmhos/cm for some of the individual treatments in the study and the salt content of compost should also be considered when applying compost to the soil. It is not always possible or practical to eliminate all salts from the soil, but managing the soil and the amount of compost applied to the soil may help to minimize salt damage in soils and to plants. Maintaining a high water content in the soil, near field capacity, dilutes salts and lessens their toxic and osmotic effects (Donahue, Miller, & Shickluna, 1983). Thus, irrigating soil lightly but frequently to elevate moisture content during the salt-sensitive germination and seedling stage should help, plants tolerate salinity associated with compost. If large amounts of compost are applied, some salt will accumulate in the soil surface or furrow ridge tops as water moves upward and evaporates.

The management system and associated technologies was demonstrated to local producers, agency personnel and Extension Field Staff through the use of Utah Agricultural Experiment Station field days in July of 1995 and 1996. An article was written for a Utah State University Extension Service insert for the *Utah Farm Bureau News*. Technology was also transferred through personal contacts as a result of articles in the *Utah Farmer-Stockman* (July-August 1996) and the *Colorado Rancher & Farmer* (September 1996). Collaborative regional training sessions are being planned and funded through PDP. A four part Extension Fact Sheet series was developed using information derived from this project.

Potential Benefits

This project provides scientific information and demonstration of an alternative animal waste treatment method. The practice provides farmers with a management tool to improve water quality and enable the producers to treat wastes and possible develop a positive cash flow from their waste management system. The practice seems particularly suited to confined animal operations which have limited access to land for direct disposal of waste products. Composting presents another viable tool for livestock producers in the Intermountain West. It requires additional management by the producer, yet provides a product which may be sold.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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Annual Results

EW95-008

Sustainable Integrated Range Livestock and Crop Production Systems

Location:
Nevada, California, Idaho, Utah

Funding Period:
July 1995 –

Grant Award:
$106,720

Project Coordinator:
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Objectives

1. Through education programs, develop a cadre of individuals competent to teach sustainable integrated range livestock and crop production systems.
2. Provide education programs on range livestock and crop production systems that optimize water management and quality.
3. Provide education programs that identify livestock production systems compatible with wetlands and aquatic bird habitat management objectives.

Abstract

A major portion of the crops in the western arid range states are grown for livestock consumption. Crop residues and crop industrial wastes provide important livestock feed resources and additional income to farmers and industries. There is clearly a high level of synergism and dependency between sustainable range livestock and crop production systems in the west. This project proposes to develop and implement training programs in at least seven states in the following three areas: (1) Integrated Range Livestock and Crop Production Systems; (2) Watershed Management and Crop Water Conservation; and (3) Livestock Production Systems Compatible With Aquatic Bird Habitat and Wetlands Management Objectives. Jim Oltjen, California, has had several "Back in the Black" sessions and is beginning part two of that project. It entails using computers to determine management strategies for ranches that includes sustainability of operations.

Subcontracts with University of Idaho and Utah for their respective projects are in progress, but not yet completed. The project in Idaho is designed to make available the state of the art technology in grazing systems and the one in Utah is to help landowners develop grazing strategies to enhance both livestock and water fowl production.

A subcontract with Golconda, Nevada sheep producer Tom Filbin has developed one of the most comprehensive sets of biological and economic data available on the grazing of alfalfa aftermath by sheep. This documents a detailed cost and return analysis for the producer grazing his sheep and for the farmer leasing his aftermath pasture for grazing. A project bulletin will be published in the next six months from this study.

Ron Torell has completed the first year of management classes for marketing of beef cattle. This emphasizes management techniques that minimize the unneeded use of pasture and feedstuffs by using marketing strategies. Ron has conducted several classes and presented material to extension educators and other professionals for use in the field. A second layer of this project involves risk management of retained ownership cattle through futures use. Futures contracts will soon be offered on weaned calves and the use of futures for risk management will be extended. This kind of planning allows for reduced rangeland impact by preplanning sale dates.

The grant sponsored two meetings jointly with the National Cattlemen's Beef Association on critical control points for profitability. This is a new national initiative for cattleman designed to enhance the viability of ranches. This ultimately leads to sustainability in that no operation can contribute to sustainable agriculture without being profitable.

The grant also sponsored a major planning meeting for Nevada Extension Educators on projects for the state emphasizing the sustainable use of rangelands and other agricultural aspects.

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Projects that will begin in 1998 include: a pasture grazing study at Rafter 7 Ranch, a three tiered marketing system at the Gund Ranch, a training program project with grazing as a means of creating firebreaks in urban areas, and a training session on animal record keeping with emphasis on matching nutrient needs to animal production cycles for extension educators. We are also working with farmers interested in developing irrigated pasture as demonstration projects.

A web site is currently being developed at UNR for livestock extension and it will be used to disseminate the SARE material. Most of the educational material is being developed in conjunction with the final report.

Jim Oltjen has conducted and is currently conducting sessions to educate county extension personnel and others on the use of the Back in the Black software and concepts. Ron Torell presented his educational material to the COIN group (a group of extension educators from the states of California, Oregon, Idaho, and Nevada) in January as well as the Nevada Cattlemen's College in May. Further dissemination when projects are completed will be through meetings, publications and the electronic media including email and web pages.

Potential Benefits

When the project is complete, there will be a greater understanding of using of irrigated pasture as a supplement or an alternative to public rangelands in beef cattle and sheep production systems. Further guidelines will help to use crop residues and supplemental crops by livestock to enhance livestock productivity, crop land fertility and farmer income. A computer program, to run under Windows, that will be used interactively to play out various possible scenarios for each individual application. The program will consider the effects on livestock growth with the use of pasture, native range, crop waste, irrigated pasture, croplands, and feeding of various purchased feeds. Effect on wildlife under various management schemes will also be incorporated. These potential benefits will enhance both sustainability and profitability of agriculture.

Impacts on Agricultural Professionals

Extension educators and other professionals have been in session with various management programs (California Back in the Black and Nevada Marketing strategies). They are now taking this information into the field. Other projects in Utah and Idaho will soon be completed and the education process beginning.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

EW96-002

Improving Manure Management to Protect Water Quality in the Southwestern U.S.

Location:
Colorado

Funding Period:
July 1996 –

Grant Award:
$60,000

Project Coordinator:
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Richard Koenig, Utah State University

Cooperators:
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John Andrews, Colorado Natural Resource Conservation Service (NRCS)
Lucy Archamboult, Prindle-Hinds Environmental Inc.
Lonnie Ashcraft, New Mexico NRCS
Shane Ball, Sustainable Agriculture Coordinator, New Mexico
Kerry Goodrich, Utah NRCS
Bill Hancock, CSU Cooperative Extension
Tom Haren, Colorado Livestock Association
Judy Kowalski, New Mexico Energy, Minerals and Natural Resources Department
Dennis Lamm, Sustainable Agriculture Coordinator, Colorado
Robert Newhall, Sustainable Agriculture Coordinator, Utah
Tim Stanton, CSU Cooperative Extension

Objectives

1. To demonstrate and encourage the use of Best Management Practices (BMPs) for poultry, lagoon, and feedlot operations within the animal production units and in crop production systems in the field.
2. To educate NRCS and Cooperative Extension personnel in methods of livestock waste utilization within the framework of western U.S. agriculture.
3. To revise and update NRCS guidelines for livestock waste management to address specific concerns for western U.S. climates, soils, and cropping systems.

Abstract

The Clean Water Action Plan proposed by the Administration of President Clinton has resulted in the development of the joint USDA-EPA Unified National Strategy for Animal Feeding Operations. This strategy is expected to affect 20,000 livestock producers nationwide, requiring them to upgrade current waste handling and storage facilities and improve manure utilization, to minimize the threat to water quality and public health. The Strategy is proposed to be implemented beginning in 1999. Several key provisions in the Unified Strategy are being addressed by this SARE-funded project: develop a comprehensive nutrient management plan (CNMP) for livestock facilities, build the capacity to help producers develop and implement CNMPs, and where possible, emphasize a voluntary approach.

In the southwestern U.S., manure management, particularly manure utilization, has generally been left to individual producers with little guidance and few requirements for determining proper manure application rates and developing a manure management plan. This SARE project is providing training on manure management and plan development to Extension and NRCS professionals, thereby allowing them to begin working with producers to voluntarily modify manure management practices.

We did on-farm demonstrations, developed notebooks, and held five workshops to train agricultural professionals and farmers in managing manure to protect water quality. Over 190 participants attended the workshops, and they estimated that they will influence manure management decision-making for over 7,300 farmers. Extension and NRCS staff in Colorado, New Mexico, and Utah are now better prepared to help farmers protect water.

Potential Benefits

As a result of the initial training and the additional training workshop scheduled for March 1999 in Utah, Extension and NRCS professionals in all three states will be prepared to help livestock producers develop the required CNMPs. Appropriate utilization of manure generated by New Mexico's animal feeding operations is dependent upon acceptability by New Mexico crop producers. Without the demonstrations developed under the auspices of this program many growers would only have hearsay to base their decisions for utilizing manure. There is still considerable effort that needs to be communicated regarding agronomic rates. However, as acceptance of manure is gained, the less potential there will be for adverse environmental impacts.

NRCS and Cooperative Extension personnel (as well as farmers) now have tools for developing nutrient management plans. The more people that are familiar with the procedures for planning manure management strategies, the less likely there will be a chance of improper application and subsequent water pollution.

Reactions from Farmers and Ranchers

Fifty-seven farmers and ranchers have been trained by this project. In addition, both the Utah and Colorado branches of Farm Bureau have started informing livestock producers on the new requirements for animal feeding operations. Initially, farmer reaction to manure management requirements was negative. Extension and NRCS professionals have been working with producers to inform them of the new waste management requirements, and to assist them in evaluating their facilities in preparation for improvements and CNMP development.

Reactions by farmers and ranchers are mixed. However, not one client interviewed has been disappointed in the information that has been communicated in the training. The notebook is easy to follow and derive the necessary numbers. However, many still wish for a one page summary that can be done in five minutes. There are still concerns about salts in the manure, the long term weed seed survivability in the manure, and the effect that composting has on survivability. These are short term problems that all have management practices that can alleviate potential problems. The more demonstrations that are available for farmers and ranchers to see the more they will be able to assess the risks posed by salts and weeds.

Future Recommendations or New Hypotheses

Extension and NRCS professionals have indicated they appreciate the training and they have requested further training, especially in light of the current Clean Water Action Plan. A guiding comment from Extension and NRCS professionals has been that manure management must be kept simple if producers are to voluntarily adopt manure management practices that protect water quality. The challenge of future training, therefore, should be to promote simplified procedures for developing CNMPs, which still meet the goal of protecting water quality.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW96-004

Extension Faculty Learning with Farmers— A Seminar Series on Sustainable Agriculture

Location:
Washington

Funding Period:
July 1997 –

Grant Award:
$36,424

Project Coordinator:
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Aaron Esser
Jon Newkirk
Tom Platt
Dennis Roe

Objectives

1. Educators and researchers together will learn about sustainable agriculture opportunities for dryland farming.

2. Extension faculty, researchers, and farmers will develop ideas for on-farm research to test sustainable agriculture concepts.

3. The Ag Horizons team will develop a summary document on the project for use by extension faculty in other states and also one-page fact sheets on individual seminars for distribution to farmers in eastern Washington.

Abstract

The Ag Horizons team of Washington State University Cooperative Extension faculty are committed to providing eastern Washington producers with an understanding of the agronomic, economic, ecological, and social impacts of agriculture and to promoting the adoption of practices that sustain the natural resource base for future generations. The purpose of this project is to educate the Ag Horizons team, along with other Extension faculty, researchers, and producers about the possibilities and options for developing agricultural management practices and markets that will sustain eastern Washington farms and farmers in the post-Farm Program era.

During the last ten months of the two-year project, the Ag Horizons team sponsored four seminars on a variety of agricultural topics. They were: The Future Of The Family Farm, Wilke Farm Field Day—Direct Seeding Project, Tour Of Wilke Direct Seeding Project Cooperator Sites, and Natural Resource Issues (for Washington Extension Agents Summer Meeting). We held the seminars in different area around eastern Washington in order to foster relationships with different grower groups. We advertised the workshops through our newsletter (circulation 1,800), flyers, county newspapers, and radio stations. Extension colleagues, NRCS, and Conservation Districts are on our mailing list.

Consistent with our goals of learning alongside farmers, we also included farmers as speakers whenever possible. Including producers as workshop participants–both as speakers and as audience–adds a dimension and level of reality that is popular with other producers and is sometimes lacking from "expert" perspectives. Researchers can be too focused and reductionist; omitting vital questions like, "What is the economic bottom line?" Farmers must run their farms as businesses, and net income determines their ultimate success.

The number of seminar participants ranged from 29 to 101. The number of Ag Horizons team members at the meetings averaged five, so the project is impacting far more than the original intended audience. Under the Freedom to Farm Bill, producers in the region are hungry for alternatives to the traditional production commodities and practices, and this seminar series is meeting a real educational need.

The Ag Horizons team completed a pre-project evaluation of our knowledge of opportunities that will sustain agriculture in the region, and we will evaluate our expanded knowledge level at the completion of the project. Evaluations from individual workshops showed that understanding of the topic was always increased among seminar participants. To date, Ag Horizons team members report that the seminar series has changed their perspective of agricultural sustainability in the region and they have used the material learned in their own educational programs.

A description of the Wilke Farm Field Day and the Wilke Project Cooperator Tour will be published in the January 1999 issue of the Ag Horizons newsletter, which has a circulation of almost 2,000 across five eastern Washington counties. This report will also be submitted to Wheat Life, a Washington commodity association magazine with a circulation of 14,000. An in-depth review of the Wilke Direct Seeding Project is scheduled for January 27, 1999 and will be advertised widely. This project follows the team principles of including a broad cross section of the community as partners. The group includes university faculty, growers, NRCS, EPA, and conservation district personnel in a full public-private partnership.

Potential Benefits

Ag Horizons team members and participating conservation district personnel have reported that these seminars have broadened their perspectives of agricultural sustainability for the region and increased their understanding of alternative practices. This will enable them to offer educational workshops that are broader in scope and they will be better able to serve as a resource for producers and other agricultural professionals

Impacts on Agricultural Professionals

Evaluations from individual workshops showed the following:

At the January seminar on the Future of the Family Farm, 85 percent of attendees left feeling somewhat more hopeful about the future of the family farm, and 100 percent felt that the information presented provided viable ideas for sustaining family farms. An Ag Horizons team member is currently beginning a project that will establish a similar mentoring process for organic vegetable growers

All the university and agency faculty attending the Wilke Project tours believed the producer-cooperator research model would provide useful information to this research project and that each producer's comments increased their understanding of the complexity of introducing a new system into a geographically diverse agricultural region? Comments included:

"I especially liked what the growers were willing to admit and show their ship wrecks. Example is the use of a hoe-type opener and the resulting wild oat problem caused by disturbance. This leaves a lasting impression that might not be conveyed by a researcher."

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW96-006

Organic Food Production and Marketing: Tours and Resource Guide

Location:
Washington

Funding Period:
July 1996 –

Grant Award:
$17,050

Project Coordinator:
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Linda Condon, Washington State Department of Agriculture

Cooperators:
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Anne Schwartz, Tilth Producers
David Granatstein, Washington State University
Diane Dempster, Charlies Produce

Objectives

1. To provide information to Cooperative Extension and Natural Resource Conservation Service (NRCS) personnel regarding organic food production.

2. To offer Cooperative Extension and NRCS personnel an opportunity to observe organic crop production and discuss organic marketing opportunities with organic growers and processors.

3. To have 30 Cooperative Extension and NRCS personnel attend organic farm tours.

4. To publish an Organic Resource Guide.

5. To disseminate 500 guides to Cooperative Extension and NRCS offices in the states of Idaho, Utah, Washington, and Oregon.

Abstract

The project's purpose is to provide information regarding organic soil management, pest control, materials use, market information, and organic certification standards for production, processing, handling and labeling of organic food. Many Cooperative Extension Service and Natural Resource Conservation Service (NRCS) personnel are unfamiliar with organic standards and organic production methods. A greater understanding of the production and marketing options available in the organic food industry will enable extension and NRCS personnel to provide more opportunities to their constituents regarding potential market and production strategies.

The organic tours were conducted in the summer of 1997 and provided useful information about cultural practices and materials used in organic food production. It also provided information about potential markets and market strategies for organic food production, processing and handling.

In December 1997, the USDA published a proposed National Organic Program in the Federal Register. The proposal would have weakened state organic standards, imposed an unfair burden on small farms and businesses, provided loopholes for many handlers of organic food, had numerous unenforceable sections, and would have disrupted export markets. Program resources were directed at responding to this proposal. In addition, the National Organic Program proposal necessitated many changes to the Organic Resource Guide.

The Organic Resource Guide is in the process of being revised for publication. We plan on having the manual available sometime early next year. The Organic Resource Guide will be published and mailed to Cooperative Extension and Natural Resource Conservation Service offices in Idaho, Utah, Washington and Oregon. The guide will be available on the WSDA web site and will also be available to the public through the WSDA office. A news release will be sent to regional news media upon completion of the guide to inform the public on the availability of the publication.

Potential Benefits

The tours and resource guide will provide information about organic standards, organic crop and livestock production, and market opportunities to Cooperative Extension and NRCS personnel. This information will enable Cooperative Extension and NRCS personnel to provide better technical assistance to the public. Farmers and others in the food industry will have the technical support to be more successful in their adoption of organic production practices and their ability to access markets with higher levels of return than conventional markets.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW96-009

Soil Quality—Educational Resources for Extension Professionals in California's San Joaquin Valley and Central Coast Regions

Location: California

Funding Period: July 1996 –

Grant Award: $98,773

Project Coordinator:
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Lonnie Hendricks, UCCE Merced County
Carol Frate, UCCE Tulare County
Tom Shultz, UCCE Tulare County
Ralph Phillips, UCCE Kern County
Malea Ortiz, USDA-NRCS
Mike McElhiney, USDA-NRCS
Rich Coviello, UCCE Fresno County
Liz Boynton, California Energy Commission

(continued)

Objectives

1. Coordinate, test and document a participatory process for determining educational needs and objectives related to sustainable agriculture in the target area, and develop high quality curricula and educational packages for the identified needs. (By curriculum, we mean an integrated educational package of written materials, video and electronic media, hands-on activities, field demonstrations, and follow-up aimed at providing practical instruction on topics related to sustainable agriculture.)

2. Produce two educational packages that can inform and be used by Cooperative Extension (CE) advisors and Natural Resources Conservation Service (NRCS) personnel to enhance extension and outreach programs related to sustainable agriculture in the San Joaquin Valley and Central Coast region (one educational package for each area).

3. Evaluate both the product and the curriculum development process and suggest ways to improve and adapt the process to other locations throughout California and the Western Region.

Abstract

Interest in the concept of soil quality and health is increasing. There are numerous efforts around the country to develop soil quality indices and soil health assessment cards, and there is a renewed interest on the part of farmers and ranchers in such management practices as cover cropping, minimum tillage, mulching, and incorporation of organic matter. This interest in soil quality was confirmed by the two educational resource development teams that guided our efforts during the first year of this project. These teams (one in the Southern San Joaquin Valley and one in the Central Coast region) included extension educators from the University of California, the USDA Natural Resources Conservation Service, state agencies and non-profit organizations. They were specifically charged with establishing the priority topics for their region for which they felt educational materials were most urgently needed.

Working independently, both teams identified soil quality and management as the top priority issue for their region. Each team also identified important sub-topics to address under this general heading, and helped formulate educational goals and objectives for the resource package. Team members and subject matter specialists were asked to contribute materials they thought would be appropriate for the resource package. Concurrently, we undertook an extensive search of our own to seek out additional materials that could be included. These materials were organized into a preliminary package and screened by team members for: 1) quality, credibility, and validity of the information and concepts, 2) relevance to soil quality issues and farm/ranch systems in the region, and 3) how easily the resources could be used in or adapted to educational programs.

The total package was reviewed and evaluated at a second round of resource development team meetings in the beginning of 1998. The package was modified (both content and organization) based on team member suggestions and previewed at two workshops in the spring of 1998 where we received additional input from farmers, pest control advisors and extension educators. The first formal draft of the package was completed in the summer and sent to 15 individuals for peer review. We are in the process of completing the package and anticipate having it ready for delivery by March 1999. It will be a three-ring binder featuring three major components: internet resources, videos and slide sets, and print publications. Print materials are organized in four areas: Soil Quality Overview, Soil Quality Assessment Methods, Soil Biology, and Cropping Systems Management. In each of these areas we have assembled articles and information sheets that can be photocopied for handouts, as well as resources for background and reference.

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Mark Cady, Community Alliance with Family Farmers (CAFF)
Casey Walsh Cady, California Department of Food and Ag, FREP

Central Coast Team

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William Chaney, UCCE Monterey County
Steven Koike, UCCE Monterey County
Sean Swezey, UC Santa Cruz
Richard Casale, USDA-NRCS
Albert Cerna, USDA-NRCS
Jeffrey Rodriguez, USDA-NRCS
Daniel Mountjoy, USDA-NRCS
Ann Lindsey, UC Santa Cruz
Jose Montenegro, Rural Development Center
Sam Earnshaw, CAFF-Lighthouse Farm Network
Shirley Humphrey, Small Farm Center

This package of educational resources is being developed primarily for extension professionals as they educate and advise producers about practices that enhance soil quality. Our specific objectives are to: increase access to information, educational materials, and expertise related to soil quality; and enhance the number and quality of educational opportunities available to producers on this topic. In working toward these objectives, we aim to raise the level of understanding among farmers and ranchers about the importance of soil quality, and provide information that helps them improve and refine their production systems.

As stated in our initial proposal, we will distribute one copy of the package free of charge to all county extension and NRCS offices in California, and also to all state sustainable ag leaders in the Western Region. Additional copies will be available for purchase.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW97-002

Sustainable Range and Pasture Livestock and Dairy Production Training for Resource Professionals

Location:
California

Funding Period:
July 1997 –

Grant Award:
$29,000

Project Coordinator:
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Barbara Reed, Dairy and Forage Crops Advisor, Northern Sacramento Valley, UCCE
Dennis Nay, District Conservationist, Glenn County Natural Resource Conservation Service

Cooperators:
Harold Hunt, Rancher, Arcata
Dan Suther, Veterinarian (retired), Redding
George Work, Rancher, San Miguel
Marcus Haney, Rancher, Oakdale

Objectives

1. Conduct a four-day course teaching the practical application of research-based management strategies that optimize economic, environmental and social sustainability of livestock and dairy production.

2. Develop, demonstrate and distribute a curriculum that educators can use to teach ranchers and dairy farmers sustainable alternatives to conventional practices.

3. Teach research design and methods needed to conduct sustainable livestock production research and demonstration programs.

4. Develop a web page on the internet and a newsletter to provide follow-up support and training for alumni.

5. Survey alumni annually to evaluate the effectiveness of training and follow-up support.

Abstract

Twenty-three Natural Resource Conservation Service and Cooperative Extension resource professionals from six western states attended the first *Grazing Academy for Resource Professionals*. The program was held October 6-9, 1998, at the Sustainable Ranching Research and Education Project site at the University of California Sierra Foothill Research and Extension Center in northern California.

Participants received four days of hand-on experience applying controlled grazing principles and learning ranch and grazing planning techniques. Topics addressed included range ecology, grazing management, and livestock nutrition. Participants were also shown how to:

1. Design effective and low cost ranch infrastructure.

2. Evaluate the economic impact of resource decisions.

3. Design on-farm grazing systems research and demonstration trials.

4. Effectively extend useful information on management intensive grazing.

Participants were also given a curriculum to use (including a slide set) to conduct seminars on management intensive grazing practices. The workbook includes over 30 articles and a dozen exercises our alumni can publish in local newsletters or reproduce and use as hand-outs at meetings they conduct.

Topics of articles include:

- Range ecology & evaluating range health
- Controlled grazing principles & practices
- Estimating carrying capacity
- Low stress livestock handling
- Troubleshooting grazing problems
- Managing through drought
- Range nutrition & supplementation principles and practices

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- Body condition scoring
- Feed budgeting
- Grazing planning
- Monitoring
- Grazing cell design
- Economics
- Fencing (13 articles)
- Water development

The workbook includes exercises on:

- Estimating carrying capacity
- Evaluating range health
- Feed budgeting
- Grazing planning
- Assessing the impacts of past management practices
- Determining appropriate rest and graze periods
- Determining the number of paddocks needed to implement management intensive grazing
- Troubleshooting range health, management, animal performance and other potential problems
- Creating the infrastructure to implement management intensive grazing
- Determining the supplementation needs of grazing animals
- Determining (in broad terms) the calving season that best matches the animals cycle with the forage cycle
- Projecting the economic consequences of management decisions

Using a small Renewable Resources Extension Act grant, we produced *The California Grazing Academy Audio Tape Series.* The series is a set of four audio tape programs on various aspects of controlled grazing. Each participant was given a set of the tapes.

Tentative dates for the second Grazing Academy for Resource Professionals are May 4-7, 1999.

Potential Benefits

Our alumni have more knowledge, improved skill and useful resources to respond to inquiries about management intensive grazing and other practices that improve the sustainability of livestock production. They have a better understanding of the challenges of systems research and have seen examples of how to conduct useful research and demonstrations.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW97-004

Developing an Educational Program for Teaching Science-Based Concepts of Grass Regrowth for Improved Grazing Management

Location:
Oregon

Funding Period:
July 1997 –

Grant Award:
$65,000

Project Coordinator:
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Kimberly Hannaway, Instructional Design
Sara Griffith, Webmaster, Dept. of Crop and Soil Science
Tom Griggs, Western Region Subject Matter Expert, CSREES

Cooperators:
Woody Lane, Forage/Livestock Instructor
Don and Virginia Wilkinson, Grass Farmers
Kathy Panner, Grass Farmer
Forage Study Group, Roseburg

Objectives

1. To create an instructional module on forage grass regrowth mechanisms.

2. To create an "Extension-type" publication that uses portions of the comprehensive grass regrowth instructional module.

3. To develop a WWW segment on forage grass regrowth mechanisms and link it to other pasture management WWW resources.

4. To create a "hybrid" CD-ROM/WWW disk that utilizes the strengths of each media type.

Abstract

This project is developing quality, science-based tools for specifically teaching how grasses grow and regrow after being grazed or mowed. This phenomenal characteristic of grasses is the best way to heal the wounds of the earth's surface and advance agricultural sustainability but is badly taken for granted, very misunderstood, and therefore, not utilized for maximum benefit. All interested in and responsible for wise stewardship of natural resources can benefit from the instructional design, collection of data, organization, presentation, and synthesis that has been completed in this first year.

Leading national experts have cooperated to impart the science of grass growth/regrowth. Instructional design and technology experts have placed the information in teachable formats on the WWW for review and discussion [http://www.forages.css.orst.edu/Projects/Grass Regrowth]. This project is linked to the Forage Information System, recipient of the Resource in Agriculture award from Links2Go. The text and artwork have been assembled for a publication for audiences less comfortable with computer technology. Software and equipment have been selected and purchased to facilitate making the WWW module into a hybrid CD-ROM/WWW disk.

The need for such work has become more and more apparent as year one objectives progressed. Work has revealed that many responsible for disseminating the science of this topic have disagreed and/or expressed their lack of knowledge about specific ramifications of grass regrowth mechanisms. These discussions pinpoint the need for the instructional tools and prepare recipients to receive them. Impact of this project will be greater than first envisioned because the need is more essential and more specific management strategies are emerging. Farmers and ranchers are beginning to use the information in workshops and meetings and plans have been made to extend the more advanced instruction in next year's programs. The results of this project will help farmers and ranchers develop skills in transferring other science to decisions for production and environmental stability.

This year has been one of integration of sources, data, opinions, and expertise. This project promised to assimilate and incorporate knowledge in three different teaching tools. Good progress has been made on all objectives. Objectives 1 (data gathering and module design) and 3 (WWW site) have been completed although evaluation and revisions are continuing. Much information has been accumulated and discussions among experts have been ongoing for all objectives so Objective 2 (publication) and 4 (CD-ROM) are in production as planned in the project timeline. Gathering and structuring the science for this project has revealed how much misinformation exists and that quality teaching tools are needed. There is extensive terminology and physiology to be presented clearly for this topic. Discussions for this project have exposed many areas of confusion. More time has been spent this year than anticipated because reviewing

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the science has led to more debate than expected. But these discussions will make the final results even more valuable. Since the science needs careful interpretation, the management strategies and applications will be more specific and productive.

To date, the findings have been presented on the WWW making them available for comment and review. Information has been used for management intensive grazing workshops and discussions with the PNW Forage Workers Group, the Oregon Extension Pasture Working Group, and two Regional Research Projects (NE-132 "Dairy Forage Systems" and WCC-091 "Forage Stress"). Materials have been incorporated into four PNW Circular publications, and discussed at various informal gatherings of agricultural professionals including NRCS and Extension personnel.

Impacts on Agricultural Professionals

The first likely impact to agricultural professionals will be a change in their thinking. Some feel that trial and error or management by calendar dates is sufficient. Some feel that regrowth cannot be effectively manipulated. Some feel most grasses are the same so different management practices are not needed. Most professionals do not have knowledge of grass regrowth because the detailed, specific information has been relegated to physiologists. This project aims to bring the scattered specific, and accurate knowledge to the managers in a usable format. Information provided to managers has been oversimplified to the point of error. They, first, must understand the benefits of understanding the mechanisms, then learn the mechanisms for grasses they manage, and then implement changes in grazing and harvesting. Then they will begin to see how yield, quality, and plant health increase and improve.

Reactions from Farmers and Ranchers

Reactions have been varied. Some farmers and ranchers are just learning to view plants from a growth and development perspective. Management intensive grazing workshops to introduce the concept of developing grazing and harvesting schedules utilizing regrowth characteristics is in its second year. Some who have participated in these introductions are now requesting more advanced workshops and applications.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW97-005

In-Depth Training and Work Experience on a Community Supported Agriculture (C.S.A.) Farm

Location:
Colorado

Funding Period:
July 1997 –

Grant Award:
$4,400

Project Coordinator:
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Jerome Osentowski, Central Rocky Mountain Permaculture
Patrick McCarty, Colorado State University Cooperative Extension
Dennis Davidson, Natural Resource Conservation Service

Cooperators:
Gil Jones, Rifle Correctional Center
Mike Dooley, Colorado Greenhouses
Tom and Sara Rumery, Osage Gardens
Laurel Dewey, Author/Herbalist

Objectives

Participants:

1. Became familiar with the philosophies and concepts of a C.S.A.

2. Are able to assist those in their home regions in analyzing the viability of a potential C.S.A. operation and in helping organize one.

3. Obtained a working knowledge of the production, marketing, and public relations skills needed to successfully operate a C.S.A.

Abstract

The Community Supported Agriculture Professional Development workshop was held in July 1998 on the Peach Valley C.S.A. Farm. During the workshop, personnel from multiple agencies were personally involved in the day to day operation of the farm. After their involvement with the workshop, participants can analyze the viability of a potential C.S.A. operation in their own region, and make sound recommendations concerning organization, structure, and operation. Labor and resource demands and profitability of C.S.A. and small acreage agriculture operations were explored in detail. Working knowledge in the production, marketing, and public relations skills necessary to successfully operate a Community Supported Agriculture Farm, were closely examined. C.S.A. can be a sustainable agriculture alternative for some operations. A profitable agricultural lifestyle can be maintained for the growers, while educating consumers on production agriculture and food quality. Professional agency participants now have an increased understanding of the viability and operations of C.S.A., and therefore can inform their constituency accordingly.

The workshop was held at the Peach Valley C.S.A. Farm on July 21 through July 24, 1998. After introductions and welcome by the Co-Sponsors, participants were briefed on the history and changing dynamics of agriculture and society in Garfield County and the Colorado River Valley area of Western Colorado. Many of these current trends parallel social and agriculture change in many areas of the United States. The loss of valuable productive crop land and the related loss of farmers and producers is a major national concern. Films were shown, depicting the basics of C.S.A. and a history of its evolution since inception in the U.S. After lunch, the group toured some of the gardens and orchards maintained by the Peach Valley C.S.A. Explanations of basic plant and fertility management and weed and pest control were given. The organic approach was compared and contrasted with traditional agriculture approaches. Participants helped in the harvest and packing of apples and apricots. Marketing aspects specifically related to the C.S.A. approach were compared and contrasted with traditional approaches.

The second day of the workshop was almost entirely a "hands on" day of harvesting and packing the weekly shares of produce for C.S.A. members. Professional agency participants worked side by side with the owners, their interns, and C.S.A. members in picking fruit and vegetables, and in weighing or counting membership shares. This knowledge, and an appreciation of the basic operation of a C.S.A., will allow the professional agency personnel the ability to assess potential C.S.A. situations in their own communities and work regions.

The "Nuts and Bolts of C.S.A." was presented by the Kuhns Family to participants and enlightened them about the sometimes hidden surprises–both good and not so good, of involvement with a C.S.A. operation. Utilizing interns and the management of an internship was explained in detail. The high public

contact of grower to consumer, was analyzed from all standpoints. The growers explained in detail the evolution, and recent surge of growth and interest in C.S.A., and how the Peach Valley operation compares and contrasts with others in Colorado and with those around the United States.

Day four was highlighted by a presentation on permaculture by a representative of the non-profit Central Rocky Mountain Permaculture Institute. There were numerous examples shown where this process of design, plant diversity, and integration has worked amazingly well in a variety of environmental situations. Much of the information presented was new to many of the participants, and numerous possibilities for application were discussed. The afternoon session was a presentation by an herbalist regarding medicinal herb production possibilities for sustainable agriculture operations. Numerous growing herb plants were observed, concerns in production management, potential profits for producers, marketing options, and consumer concerns and uses were explained.

In conclusion, professional agency participants were exposed to multiple facets of Community Supported Agriculture, and related sustainable agriculture scenarios. Those participants now have the abilities, as trainers themselves, to assess their communities in the viability of such operations, and to advise individuals and groups in basic C.S.A. set up and operation. Information has been, and will continue to be, provided to additional agency personnel with interest in C.S.A., who were unable to attend the workshop. Participants will be contacted in 1999 as to the continuing relevance and use of material presented at the 1998 sessions. C.S.A. is certainly not for everyone (producer or consumer) but does have tremendous value in applicable instances and can keep agriculture viable in those scenarios. There are some tremendous social values for both producer/growers and shareholder/consumers in working together closely in a C.S.A. Farm. Those professionals who participated now understand these often overlooked added values, and much, much more about Community Supported Agriculture after being involved in this "hands on" workshop.

Potential Benefits

After being involved in this project, trained agency educators are better able to respond to information requests concerning Community Supported Agriculture and related sustainable agriculture issues. These requests could be either from consumers who are potential C.S.A. shareholders, or from farmers/growers who may be investigating a C.S.A. as a method of profitably remaining in agriculture. This valuable help, in providing critical new enterprise analysis, is essential in giving sound advice for keeping producers in business or in creating successful new sustainable agriculture businesses. Those trained in the issues of C.S.A., will serve as resources for other professionals within multiple agencies in examining the C.S.A. approach.

Impacts on Agricultural Professionals

Post workshop questionnaires indicated that the specific knowledge of Community Supported Agriculture and related sustainable agriculture issues, dramatically increased by participants attending the workshop. Most participants understood relatively little about C.S.A. before the workshop and felt they had a good understanding of a C.S.A. afterward. Also, they would be able to assess a possible C.S.A. scenario from multiple aspects, as to potential future success.

Reactions from Farmers and Ranchers

Although not a primary target audience, the few producers directly involved learned an immense amount about C.S.A.'s, which most said they were not familiar with prior to the workshop. These producers commented about having an increased understanding of C.S.A. after the workshop.

Future Recommendations or New Hypothesis

Future projects need to be flexible in nature to allow maximum participation from diverse audiences. There seems to be an increasing interest in examining markets and marketing possibilities in agriculture, and not in just improving production techniques. Newer concepts and approaches in marketing need to be readily advanced to agency professionals and producers alike. The personal interaction and communication when multiple agency educators are gathered together has a tremendous educational value in itself.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Annual Results

EW97-007

Sustainable Agriculture Youth Educators: Professional Development for Youth Program Leaders and Educators

Location:
Montana

Funding Period:
July 1997 –

Grant Award:
$100,000

Project Coordinator:
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Van Shelhamer, Department of Agriculture Education, MSU
Jonda Crosby, AERO
Kerry Wall Mac-Lane, AERO
Jamie Ogden, Bitterroot Downhome Project
The Information Technology Resource Center at the University of Montana

Objectives

1. Build the capacity of educators to teach sustainable agriculture to youth and to their peers.

2. Strengthen institutional support and leadership of Cooperative Extension, Agriculture Education, Natural Resources Conservation Service, the Montana Department of Agriculture and others needed for those teaching sustainable agriculture.

3. Design and test a model "continuum of learning" in sustainable agriculture.

4. Disseminate the continuum of sustainable agriculture learning materials and the community based train-the-trainers model that will result from this project.

Abstract

This program is modeling a community-based approach to educating leaders and educators of youth about sustainable agriculture, collaborative learning and systems thinking. The program consists of four interactive components:

- The Leadership Team is an umbrella group of eight state-level administrators of youth programs representing state and federal agencies and institutions, as well as private, non-profit organizations. The Leadership Team collaboratively implements all aspects of the program and provides institutional support for the community-based Educator Teams. AERO staff consciously, carefully and intentionally nurtured group ownership of the program by: encouraging team participation in every aspect of program development and implementation, hiring a logistics coordinator and evaluator, modeling the principles of shared leadership, and collaboration and inclusiveness in leadership behavior.

- A network of five Educator Teams are active across Montana. Educator Teams are groups of at least four educators, community members and youth who work together to design and test learning materials and experiences that help youth understand the interconnectedness of people, community, environment and agriculture; engage youth in systems thinking, community action, and collaborative learning; and catalyze new partnerships between educators, community members and organizations, farmers, ranchers, and youth. Because Educator Teams are linked through their members to communities, they are in the best position to respond to the needs and interests of local youth, educators and communities. Each team is learning about a different aspect of sustainable agriculture in Montana, including cereal-legume cropping systems, grazing systems, horticulture, vermiculture, and community gardening.

- Educator Teams are key to disseminating the community-based model for learning about sustainable agriculture. The first set of seasoned Educator Teams, now active, will train the next set of Educator Teams in January 1999. Each subsequent set of Educator Teams will modify and refine the training design and learning continuum to meet changing needs of their communities, and gradually expanding the state-wide network of teams. Educator Teams are building their capacity to teach sustainable agriculture to youth and to their peers.

- Educator Teams and the Leadership Team are creating the Sustainable Agriculture Continuum of Learning, which is housed on a state-of-the-art interactive Web site. This is a sustainable agriculture teaching unit comprised of materials and tools drawn from existing educational programs and created

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by project participants. It will eventually include a variety of sustainable agriculture and systems-thinking teaching materials and methods, including classroom and field activities, problem cases, study materials, and hands on projects. It is a continuum, not a curriculum per se, because educators and students can pick and choose from it according to their interests, needs, knowledge, skills and progress to create their own individualized education programs. The learning continuum is housed on the World Wide Web at: http://oats.itrc.umt.edu.

In the first year of this program, we laid the groundwork for disseminating findings in the future. Dissemination of findings is a focal point of the program's second year of work. The interactive Web site housing the "Continuum of Learning" for sustainable agriculture is active and on-line. The Web enables us to disseminate program results to an audience that is larger and broader than any we could reach by advertising the materials in a brochure and sending out hard-copies. The Web enables us to disseminate program results in a cost-effective and labor saving manner, as well. We will begin realizing the benefits of this technology once program participants become more comfortable with it and upload learning materials.

Potential Benefits

The benefits of this program are already being realized, and we anticipate more next year. The program is: bringing principles of sustainable agriculture into mainstream thinking among agricultural educators of youth; bringing sustainable agriculture into mainstream agricultural education with a healthy amount of what Lauri Olsen, the Logistics Coordinator observes as, "struggle and compromise"; helping community groups leverage funds for sustainable agriculture education projects (Operation Green Thumb was recently awarded a grant of $33,000 from the Montana School-to-Work Program); broadening the definition of what constitutes agriculture in Montana and helping youth understand the role sustainable agriculture plays in their community's economy; building bridges between community members and youth; bringing information about sustainable and large-scale dryland cereal-legume cropping systems to the Web; and testing a model for supporting community-based education and knowledge development, resulting in institutional change.

Impacts on Agricultural Professionals

The program is enhancing agricultural professionals' understanding of and support for sustainable agriculture, collaborative learning, systems thinking, and community-based education. This is what they say about the program:

"As a result of this program we are all moving toward a better understanding of what sustainability is. I'm not sure any of us totally agree upon what it is, but at least we are talking. I am excited by the idea of community members working together and by the interdisciplinary education that we are testing in this program."

"I have learned more about systems thinking, collaboration, and team dynamics which will definitely impact my future in designing agricultural education programs, especially in professional development at the college level."

This professional development program is a bit different from others supported by SARE. Instead of farmers and ranchers, youth are the indirect target of the program. Young people are an important audience for sustainable agriculture education. They are our future farmers, policy makers, community members and consumers. Young people's interest in agriculture is growing in Montana and is reflected in the increasing enrollment in secondary agricultural education courses. Following is an example of how youth are reacting to the program:

"The systems thinking exercise that we did at the workshop was really new to me. Since then I have used parts of that exercise in some of the clubs I am involved with at school. For example, the Future Homemakers of America club was frustrated by its small membership—only four students. Using systems thinking we started by asking what the root of our problem was. Once we figured out the root problem, then we focused on solutions to the problem. We have acted on some of the solutions. We have 14 club members now. I also like systems thinking's emphasis on planning before acting."

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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EW97-012

Compost Education and Information Access for Western Agriculture Western SARE Professional Development Project

Location:
Various locations within Western Region

Funding Period:
July 1997 –

Grant Award:
$145,275

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Paula Jones, NRCS - Idaho, Pocatello, ID
Dan Sullivan, Oregon State University, Corvallis, OR

(continued)

Objectives

The goal of the project is to increase the knowledge, effectiveness, and comfort level of agricultural professionals in dealing with agricultural composting issues. To advance this goal, the project has the following objectives.

1. Impart a "beyond-the-basics" understanding of composting to agricultural professionals (e.g. educators, advisors, service providers).

2. Provide resources for participants to extend composting knowledge to local clientele.

3. Establish mechanisms for agricultural professionals to access and retrieve current information about composting and the performance of compost in agricultural production systems.

Ultimately, the aim is to improve and expand the practice of composting within western agriculture, and thereby enhance agricultural sustainability.

Abstract

The project is being conducted under the working tittle of "Compost Education and Resources for Western Agriculture" or CERWA. CERWA is a regional two-year comprehensive educational program for agricultural professionals about agricultural composting and compost use. The project effectively began with a planning meeting of the project team in February of 1998. As of this writing, CERWA is nearing its halfway point. One satellite workshop has been conducted. Two additional workshops are planned for 1999. In addition, the project has produced other training and educational products including a web site and regional newsletter.

Regional workshops: The core of the CERWA project is a series of multi-state/multi-site concurrent workshops, linked together by satellite. At each site, a facilitator coordinates the satellite instruction plus additional on-site presentations to address local issues and conditions. Three workshops are planned. The first took place on November 5, 1998. The two remaining workshops will be held in 1999.

The first workshop, "Composting: A Tool for Western Agriculture," covered the opportunities, benefits, and drawbacks of composting in an agricultural setting. The broadcast was received by at least 47 local sites in 13 states plus sites two provinces of Canada. The Pacific territories will be holding local workshops at a later date using a tape of the broadcast as the basis. Total attendance at local workshops was estimated to be more than 550. The audience was diverse. Approximately one-fourth of participants were ag professionals in Extension, NRCS and other governmental agencies. More than one-third of the audience were producers. Other participants were consultants, composters, city and county employees and members of various organizations. The two hour broadcast featured video tape of numerous agricultural compost producers from ten states and provinces in the west. Most local workshop sites added to the workshop with local presentations and discussions. Feedback from viewers has been very positive.

The second workshop will take place on January 14, 1999. It will concern the use of compost in agricultural production systems. Generally, the local sites which participated in the first workshop will also participate in the second workshop (several sites have been added). The third workshop is currently scheduled for the autumn of 1999. It will cover compost trends and key issues.

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David Bezdicek, Washington State University, Pullman, WA
Kitt Farrell-Poe, University of Arizona, Yuma, AZ

Resource materials: Workshops are supported by resource materials including a manual of literature, video tapes, and slide sets. The resources will supplement the workshops and aid participants in teaching their own clientele. A manual of literature was provided for the first workshop and another is currently being assembled for the second workshop. Also, video taped copies of the first broadcast have been duplicated and are available upon request. To date, 20 tapes have been distributed in response to requests.

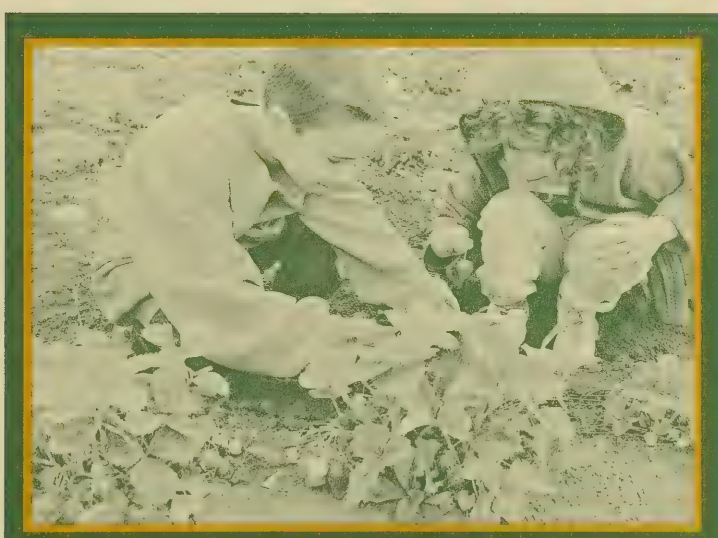
Information access: A newsletter, originally produced in Washington called "Compost Connections," has been expanded into a regional publication via this project. The newsletter includes articles about compost-related research, practice, and activities within and beyond the region. Two regional issues have already been distributed and a third issue will be distributed in December 1998. Approximately 1,500 newsletters go to Extension and NRCS offices within the region plus a small number of individual subscribers. Issues have also been included in the workshop manuals plus are accessible electronically via the project web site. An internet web-site for the project has been established. The URL for the site is: www.aste2.usu.edu/compost/. The web site serves as a source of information about the project and the workshops. It also functions as a clearinghouse for compost information. For example, answers to the questions submitted by the audience during the first satellite workshop have been posted to the web-site.

Information gathered through CERWA is and will continue to be disseminated via several educational products. The primary mechanism is the workshop series, including both the broadcasts and the local workshop activities. Other project components are intended to help the audience extend the training to clientele and to provide them access to more detailed and emerging information. These components include the newsletter, web site and written resource materials. In addition, CERWA will provide slide sets, video tape, and a college-level internet course. Although slides have been collected, the slide sets have not been developed. Input from workshop facilitators is being collected regarding the desired purpose and content for the slide sets. The current plan is to produce a condensed, 'stand alone' video from the footage used for the satellite broadcasts. The internet course will be one of the last components of the project to be developed. It is expected to be available by the end of 1999.

Potential Benefits

Composting and compost use offer many potential benefits to agriculture and the environment. Thus, these practices are expanding quickly across the Western region. Agricultural professionals are struggling to handle the requests generated by the rising tide of interest in compost. In general, they lack the information and the depth of understanding to do what they are being asked to do: teach farmers about the benefits and costs of composting, advise on how to adapt the farm management system to the use of compost, answer questions about odor, evaluate compost use as a conservation measure, comment on pending regulations, and advise local officials. The knowledge that many agricultural professionals acquire about composting often comes from a few sources with limited experiences. CERWA will broaden and deepen their understanding of composting and compost including the applications, practices, benefits, and limitations. Hopefully, agricultural professionals can then better help farmers determine if composting and compost is a right for them and assist them in implementing these practices in the production system.

This summary was prepared by the project coordinator for the 1999 reporting cycle.



Western SARE

Final Results :

PROFESSIONAL DEVELOPMENT PROGRAM, PDP

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EW94-014 Continued

Training "Agents" in On-Farm Implementation of Sustainable Management Systems for Tropical Agriculture in Hawaii and the Pacific Region

Location:
Hawaii

Funding Period:
July 1994 – June 1997

Grant Award:
$63,623

Project Coordinators:
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Major Participants:
Bob Barber and Frank Cruz,
University of Guam

Objective

1. To develop extension training curricula emphasizing the paradigm of sustainable agriculture under island eco-systems and to train extension agents and other field-level agriculture professionals to enable them to help farmers implement sustainable agriculture strategies at the field level in tropical areas of the Western Region.

Abstract

In 1997, twenty six Pacific Region Cooperative Extension agents and five Natural Resource Conservation Service (NRCS) field staff from the islands of Hawaii, Guam, Majuro (Marshall Islands), Saipan (Northern Mariana Islands), Palau, Pohnpei and Kosrae (Federated States of Micronesia), and American Samoa received training in sustainable agriculture management systems in three training sessions in Hawaii, Guam and Pohnpei, Micronesia. This second year training was designed to develop training modules, emphasizing a more intensive, hands-on approach through on-site demonstration programs. A major focus of this year's training was an emphasis on traditional Pacific Island agricultural systems and aquaculture operations, and the land-sea connections intrinsic in island cultures.

Demonstration sites were established on the islands of Guam, Pohnpei, and Kauai (Hawaii) prior to the training to provide farmers and agents valuable experience, tools, and skills to develop, evaluate, and more effectively deliver sustainable agriculture concepts and practices introduced in the first year training. Agents met for three intensive, week-long, immersion courses from March 10-April 4, 1997, to learn about Agroforestry, Composting, Farm Financial Management, Participatory Research and Extension Techniques, Nutrient Management, Cover Crops, Native and Useful Plants, Aquaculture, and Biologically-Based Pest Management. Agents will continue to hold sustainable agriculture workshops/demonstrations on their own islands following the training. Funding has been requested to develop video tapes of these topics to further increase the dissemination power of these trainings.

The first training session was held in Hawaii, from March 10-14, 1997, on the islands of Kauai and Molokai. Agents from ten islands in the Pacific met at a certified organic farm on Kauai to view the on-farm demonstration of botanical insecticides (neem, pyrethrum and rotenone) used against a new insect pest of vegetables and herbs in Hawaii. An instructor from the USDA emphasized the value of biologically-based fruit fly management, a major pest of most island fruits and vegetables. Visitation of an integrated aquaculture-agriculture operation exposed agents to the value of incorporating a normal pollutant, fish culture effluent, into a taro (*Colocasia esculenta*) operation. On the island of Molokai, where diversified agriculture is promoted as a replacement for the abandoned pineapple fields, the theme of the training was "Biologically-Based Fertilization and Nematode Management."

The second training session was held at the University of Guam from March 23-27, 1997. The theme of "Participatory Research and Extension (P R & E) for Sustainable Agriculture" was developed to lead agents into a discussion on external forces affecting traditional agriculture in the region: land tenure issues (lack of access to permanent holdings), limited resources, and population increases due to immigration from outer islands. Strengths in these systems include strong family support, extensive local knowledge, and an environmental awareness that agricultural activities up-stream affect the productivity of the reef down-stream (a critical factor for island economies).

For the third session in the training, agents were transported to the even more isolated island of Pohnpei in the Federated States of Micronesia (FSM). Trainees participated in an on-farm planting of sakau which

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will rely on the inherent fertility of this site via N-fixing companion tree species and rotations of crops over time. A field visit to an upland agroforest-sakau planting brought about an appreciation for the evolution of traditional agroforestry systems on more sustainable (less erosive) lowland areas into native upland forests where the environment is more fragile. Participants from Hawaii, Guam and American Samoa also presented information on several livestock operations using sustainable practices, including the Deep Litter compost system in Hawaii; the pelletizing of kitchen wastes into pig feed in Guam, and the construction of septic tanks with effluent-use possibilities at a piggery in American Samoa.

The dissemination of findings from these trainings has been a continuum since the 1995 Hawaii trainings, in that seven agents have offered sustainable agriculture workshops or field days since that period, and all have incorporated sustainable agriculture information in their classes, according to a random survey of participants. The College of Northern Mariana Islands in Saipan has expanded a trial of multipurpose *Leucaena* trees for fertilizer, fodder, and fuel; Molokai Applied Research Farm now has permanent plots of cover crops for use in rotations with edible crops; and the University of Guam continues to hold trainings at its Aquaculture Demonstration site. Monthly telephone conference calls were scheduled by the training coordinator through PEACESAT, a satellite link-up through the University of Hawaii-Manoa, to provide progress reports and receive feedback from other agents.

Potential Benefits

The positive benefits of this program are enormous: we now have in the Region a close-knit group of agents dedicated to sustainable agriculture for the Pacific Islands. Three SARE proposals were written by the SA core group, including a research proposal on the use of rotations of cover crops in vegetable crop systems on the islands of Hawaii, Saipan, American Samoa and Guam, and a continuation of the PDP with a video component. In addition, several SARE Farmer-Rancher grant proposals were written with agents from the SA group, including a project using soap-based products as virus mitigants/insect-repellents in Hawaii and a medicinal herb project in American Samoa. Agents who had no previous experience with writing grant proposals are now interested in seeking extramural funding to support their SA efforts.

Impacts on Agricultural Professionals

Based on evaluations from the participants, the majority of trainees felt that the training offered valuable information and skills which would be used on their own islands. Trainees are now better equipped to respond to producers' requests for sustainable agriculture information as a result of knowledge gained through these trainings. "We must keep the momentum going," wrote one agent, "we have so much more to learn in the area of sustainable agriculture." In addition to the on-farm/on-station SA projects, which will provide additional SA information for their clientele, agents are preparing additional field days and workshops on SA practices. The training manual which was produced for these sessions provides valuable resource material for dissemination.

Reactions from Farmers and Ranchers

The interest from the farmers and ranchers associated with the SARE Program has not waned, as nine farmers were involved as trainers and participants in this year's training. Several SA farmers in Hawaii, however, felt that their continued involvement would be based on the University's attitude towards organic farming methods (i.e., through their representation on the SA Task Force). "Organic" farmers in the traditionally farmed areas of the Pacific Islands represent the mainstream and do not feel animosity from University personnel. Feedback from the trainees regarding the integration of farmers/ranchers as resource personnel included a deep appreciation of their experience and local knowledge, and the desire to continue to involve them in future trainings.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Final Results

EW95-003

Agency Personal Training in Riparian Monitoring and Management of Wildlife and Livestock in the Intermountain West

Location:
Montana, Wyoming and Idaho

Funding Period:
July 1995 – February 1999

Grant Award:
$98,000

Project Coordinator:
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Jim Hagenbarth, Rancher, Dubois, ID
Maynard Smith, Rancher, Glen, MT
Dave Mannix, Rancher, Helmville, MT
Meg Smith, Rancher, Divide, MT

Objectives

1. Conduct workshops for Western Region agency personnel aimed at developing expertise in providing riparian monitoring and management education to local ranchers.

2. Develop demonstration areas to show on-ground practices for managing herbivore (livestock and wildlife) use of riparian areas.

3. Develop demonstration areas to illustrate strategies for monitoring wildlife vs. livestock use of riparian areas.

4. Develop demonstration areas to demonstrate strategies to lure herbivores from riparian areas using salt, fertilizer, supplement and water.

5. Conduct demonstrations to illustrate the need a) to develop riparian condition goals and, b) to utilize effective and economical methods of monitoring livestock use of riparian areas.

6. Summarize results and strategies in publications and handbooks.

Abstract

The sustainability of livestock operations in the intermountain west is often dependent on the sustainability of riparian areas. Many producers rely on personnel within the Cooperative Extension Service (CES) and the Natural Resource Conservation Service (NRCS) for assistance and expertise in management and monitoring of riparian areas. The purpose of this project was to increase the understanding and proficiency of Western region agency personnel so they could conduct educational programs and develop demonstration areas at the local level and respond to client needs in sustainable riparian management.

A unique aspect of this project is that we have taught others to become teachers. In this way the multiplying effect of the effort was maximized. During the first year of the project we developed the demonstration areas that were used during the training sessions, which were in 1997 and 1998. Cross-riparian drift fences, off-site waterers, off-site fertilizer plots and other management demonstrations have been installed. The areas for wildlife vs. livestock grazing demonstrations were completed. Coordination to identify appropriate contacts to maximize workshop attendance was completed between Montana, Idaho, and Wyoming.

A three-day workshop for County Agents, and the NRCS was held August 19-21, 1997. A total of 32 CES, NRCS, ranchers, and CES/University participants attended. Pre- and post-workshop evaluations were used to direct the next workshop. The 1998 workshop was held August 25-27 for 28 participants. Modified workshops were held for 20 and 15 participants, November 5-6 and November 9-10, 1998 respectively. Workshops had participants from Montana, Wyoming, and Idaho, and included NRCS and CES personnel. Publications and home study courses are in progress describing best management and monitoring practices have been developed and will be ready for distribution in the spring 1999.

Installation of demonstration area began during the first year of the project. These demonstrations were used as field trip teaching sites during the workshops. Additionally, information collected at the sites was presented and provided workshop participants with a better understanding of the value of demonstration areas in their training programs. Two cross-riparian drift fences were built on Alan Carter's and Andy

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O'Hara's ranches south of Livingston, Montana. Sixteen elk-cattle enclosures were built on the Bandy Ranch near Ovando, Montana. Demonstration areas to monitor the effect of grazing on forb production were also located at the Bandy Ranch. Off-site waterings, fertilizer, salt and supplement demonstration areas were established in numerous locations in northern Wyoming, eastern Idaho and in the Southwest Montana area. These areas were the primary focus of the workshop and serve as illustrations of riparian management and monitoring. Originally, two training workshops were planned for the same year. To ensure availability of the most qualified workshop instructors, including rancher and commodity group participants, the coordinating committee decided to focus on one workshop each year. Both have been completed and two additional modified workshops were held in November for participants that could not attend the more detailed field-orientated courses. Information developed prior to and during this project is summarized in a publication on Managing Cattle Grazing in Riparian Areas. A video has been developed to introduce and encourage ranchers to become riparian managers.

In addition to the workshops, information will be disseminated through a workshop publication. Workshop trainers prepared a handbook that describes best management practices taught during this project. Also, through this SARE program a video has been developed introducing home-study that county agents and NRCS personnel can use in their areas to train ranchers. This introductory video, Riparian Area Management: An Overview, is also being prepared to introduce ranchers to the benefits of increasing their riparian management knowledge through a home study video course.

Potential Benefits

To sustain ranches in the intermountain west, ranchers must become active managers of riparian areas. This includes an understanding of riparian processes, the ability to define what they hope to achieve through riparian management and the ability to monitor the progress they are achieving through their riparian management program. The most logical and effective way to provide this knowledge and ability to ranchers is through local county extension agents and Natural Resource Conservation Service personnel. The purpose of this project is to provide the training necessary for CES and NRCS to fulfill this role in the Western region and to develop demonstrations of successful riparian management strategies on working ranches.

Impacts on Agricultural Professionals

Through pre- and post workshop evaluations, we are able to quantify the pre- and post-workshop changes in competence and attitude of participants. These results, which indicate significant benefits of the training, are summarized below.

Prior to the workshop, 53 percent of the participants indicated riparian management was in the upper ten percent of priorities in natural resource management. After the workshop, 69 percent of the participants felt riparian management was in the upper ten percent of natural resource management priorities.

Prior to the workshop, only 62 percent of the participants felt capable or very capable of teaching others about riparian management. After the workshop, 92 percent felt capable or very capable of teaching riparian management. Additionally, there was a 23 percent increase in the number of participants who now feel very capable of teaching riparian monitoring.

Reactions from Farmers and Ranchers

Ranchers have been used as instructors for both years of the project. They have commented on the practical nature of the workshop and how they were pleased the workshop participants were getting practical field demonstrations. The ranchers commented that their peers would be much more receptive to practical hands-on workshops.

Future Recommendations or New Hypotheses

As the project progressed we realized that we would not be able to accommodate all the riparian training needs or clientele that wanted the training. We decided to merge our effort into another project designed to provide detailed instructions using publications, videos, and demonstration areas developed by both projects. This would have been more easily accomplished early in our project. We recommend that future Professional Development Projects consider complementary projects that are ongoing. Coordination of effort can result in a longer-term and a farther-reaching educational program.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western Region
Sustainable Agriculture Research and Education

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Final Results

EW95-012
(previously EW94-006)

Sustainable Agriculture Training Project: A Model of Collaborative Learning

Location:
Idaho, Washington, Montana, Utah and Wyoming

Funding Period:
July 1995 – September 1997

Grant Award:
$31,450

Project Coordinator:
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Alternative Energy Resources Organization (AERO)
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Major Participants:
Palouse Clearwater Environmental Institute (PCEI)

Cooperators:
Farm & Ranch Improvement Clubs in Montana, Idaho and Eastern Washington
University of Idaho Cooperative Extension
Washington State Cooperative Extension (WSU Extension)
Idaho Rural Council (IRC)
Idaho Natural Resources Conservation Service (NRCS)
Idaho RC&Ds

Objectives

1. Evaluate and revise the curriculum from the 1995 program and produce the materials necessary for it to be used by others to further implement the training.

2. Hold the multi-day core training in another state (we chose Idaho).

3. Target follow-up and financial support for participants in the 1995 program to implement projects and deliver training within their agencies. Follow-up with participants in the 1996 training through the growing season to assess their success in fostering sustainable agriculture in their arenas.

Abstract

This professional development program targeted five states in the Intermountain West: Montana, Idaho, eastern Washington, Wyoming and Utah. In 1995 Montana was the program site. In 1996 Idaho was the program site. We used the evaluation of the program in Montana to improve the program we offered in Idaho. The curriculum emphasized the most successful and valued elements of last year's training. We continued to use as trainers farmers and ranchers who are leaders in sustainable agriculture and involved in farm improvement clubs. We also emphasized sessions featuring case studies, collaborative problem-solving and research, and hands-on experiences, such as farm tours, and opportunities for participants to network with each other and talk about sustainable agriculture projects they are already working on.

The program in Idaho was a logical extension and improved version of the one conducted in Montana. This program included: 1) a collaborative effort to plan and design a professional development training program involving agency leadership in Idaho and Washington, PCEI, IRC and AERO; 2) a two-day professional development training workshop and farm tours in Idaho; 3) over 30 farm tours and workshops hosted by farm improvement clubs across Montana, Idaho, and eastern Washington; 4) a tour by WSU Extension's Ag Horizons team, whose focus was sustainable agriculture, of exemplary farms in Montana; 5) a small grants program for agricultural service providers wanting to initiate projects or activities designed to help them and others learn more about sustainable agriculture; 6) a training workbook which others can use to conduct similar programs elsewhere; 7) an AERO co-sponsored workshop on composting at Montana State University (MSU); 8) a session at MSU's Crop Pest Management School; and 9) two annual gatherings of farm improvement clubs–one in Montana and one in Idaho. Farmers and ranchers were an integral part of each piece of the training. This program effected well over 400 people in the region.

The training events themselves served to disseminate information beyond the trainees to farmers and ranchers and federal and tribal personnel who attended some of the training events. The most effective dissemination seemed to come through face-to-face contact between and among trainees and farmers and ranchers, primarily farm improvement clubs.

SATCHEL: Sustainable Agriculture Training Curriculum Handbook for Educators and Leaders documents what AERO learned about helping others understand the principles and essence of sustainable agriculture. It is designed to help others develop and deliver their own professional development programs. This document will be sent to all participants attending the training in Idaho. The document will be available to the public and participants attending the training in Montana for a small fee.

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Impacts on Agricultural Professionals

The success, to date, of this Chapter 3 professional development program includes: 1) a network of agency leadership, who helped plan the training, that can provide on-going support for their field staff working with producers engaged in sustainable agriculture; 2) an expanded regional network of professionals who understand the principles of sustainable agriculture and collaborative learning and can provide each other with support and information; and 3) agency professionals that understand that sustainable agriculture is about more than practices–that systems change is complex and requires problem-solving skills and facilitation rather than simple question-answering.

This professional development program overall had a positive impact on participants and institutional support for sustainable agriculture. One year after the training, participants were contacted for a phone interview to learn how the training impacted them. Data from the interviews shows that the training effectively: 1) boosted participant's confidence in advocating for and communicating the principles of sustainable agriculture; 2) created a constituency supportive of sustainable agriculture among technical assistant providers; 3) catalyzed institutionalization of sustainable agriculture; 4) deepened participant's understanding of sustainable agriculture; 5) broadened the role of technical assistance providers to include facilitator and co-learner; and 6) provided the climate for institutional receptivity to sustainable agriculture and professionals working on sustainable agriculture on farms and private organizations.

Reactions from Farmers and Ranchers

This program has resulted in developing a cadre of agency technical assistance providers in five states, primarily in Idaho and Montana, who are learning new approaches for serving farmers and ranchers and rethinking their roles. Here is how a few participants said, in their evaluations, the program impacted them:

"When the energy of community is there, agencies should step back and just provide logistical support and help facilitate. This project will change the way we [resource conservationists with NRCS] do this kind of work in the future. Our tour was planned by a team of agency people and ranchers, with ranchers taking the lead. The result was a tour that many said was the best they had ever been on."

"As an agronomist I realize that my role when working with farmers should be more of a facilitator. This workshop helped me do that."

"I'm learning that things are changing. The outside expert approach is dying and the collaborative approach is the coming thing."

As a result of the program, farmers and ranchers involved in sustainable agriculture in Idaho and eastern Washington are noticing more support for and interest in their projects by local agency technical assistance providers. Nancy Taylor, then coordinator of northern Idaho's farm improvement clubs supported by PCEI said, "This year [1996] farm clubs are telling me that it has been much easier to garner support from local Extension agents and resource conservationists for their projects."

Future Recommendations or New Hypotheses

This professional development program benefited from two consecutive grants from SARE. The year's program in Idaho encompassed the best of the program we offered in Montana – thus resulting in a more effective program. We learned a lot about leading a Chapter 3 professional development program. 1) The program must cover not just what sustainable agriculture is and how to go about it, but how to best serve producers interested in it. This means acquiring both an understanding of new roles and processes of inquiry and support and technical knowledge. 2) Farmers and ranchers are invaluable as trainers, and are integral to each part of the program. 3) Incorporating the farm tours into the core training gave participants a chance to mesh theoretical learning with experiential learning, and ensured a continuity of participation. 4) Having written case studies about the farms on the tour is an effective way to prepare participants for the visits. 5) It is important to encourage public agency ownership in the program by involving them in the planning and implementation process. 6) Involving public and private organizations in the planning and implementation process fosters new roles and relationships. 7) It is most effective to engage a few high quality trainers. We believe that participants were able to delve deeply into a few topics by giving a few trainers more time for their sessions. 8) It is important to ensure that the trainers communicate a consistent message of a sustainable agriculture approach. 9) Two and a half days for the core training is adequate.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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Sustainable Agriculture Research and Education

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Final Results

EW95-015

A Consortium-Based Sustainable Agriculture Training Curriculum Plan (SATP)

Location:
California

Funding Period:
July 1995 – December 1997

Grant Award:
$20,000

Project Coordinator:
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Major Participants:
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Steven Gliessman, Professor of Environmental Studies and CASFS-UCSC
Matthew Werner, Soils Specialist, CASFS-UCSC
Alan Harthorne, Program Manager, Agribusiness Institute, California State University, Chico
Richard Smith, Farm Advisor, UC Coop. Ext., San Benito County
Marc Los Huertos, Graduate Research Assistant, Dept. of Biology, UCSC
Daniel Mountjoy, Soil Conservation Specialist, USDA-NRCS, Salinas
Jose Montenegro, Rural Development Center, Salinas

Objectives

1. Organize a sustainable agriculture curriculum plan in a format pertinent to the training needs of University Cooperative Extension, USDA, and other appropriate extension agency personnel.

2. Develop a consortium list of experts with sustainable agriculture training and teaching experience comprised of CASFS affiliates, Cooperative Extension and USDA personnel, farmers and agricultural professionals, and consultants.

3. Conduct, with additional funds, trainings involving seminars and direct field experience with sustainable agricultural systems, utilizing the curriculum plan for the intended audience.

Abstract

The consortium-based Sustainable Agriculture Training Program (SATP) curriculum plan at the University of California, Santa Cruz Center for Agroecology and Sustainable Food Systems (CASFS) is comprised of nine modular units on topics selected from priority subjects and clientele cited in the 1995 California Statewide Plan for Professional Development and In-Service Education in Sustainable Agriculture, coordinated by the University of California Sustainable Agriculture Research and Education Program, Davis.

Each module (designed for periodic review and updating) consists of a brief referenced introduction and a topical outline (to focus seminar or training discussion), whole-farm case studies guide and citations, practicum/field training exercises where relevant, and information, networking and literature/media. A list of consortium members with expertise as seminar or training leaders is also included.

A Consortium-based Sustainable Agriculture Training Program at CASFS offers a modular (each module can stand alone in a training) plan for training for Cooperative Extension (CE) advisors and USDA-Natural Resources Conservation Service (NRCS) field staff (and their colleagues and clients) who have not had previous in-depth exposure to the concepts, production practices, economics, public advocacy, or market environment of sustainable agriculture in California. The training Program plan is designed to introduce: 1) definitions and concepts of sustainable agriculture, 2) theory and practice of sustainable agricultural production and/or production for transitional and certified organic markets, 3) demonstrate the agronomic and economic feasibility of sustainable farming technologies in a series of on-farm, whole-systems examples from the production community, and 4) introduce trainees to literature, information networks, media, and other sources of information, especially in the form of the SATP Consortium, as mentor-trainers and advanced information sources in sustainable agriculture.

Potential Benefits

The CASFS SATP plan is designed to allow trainees the following:

1. Understand the modern principles and practices of agricultural sustainability, the interaction between agriculture and the environment, and the importance of protecting resource quality, wildlife, human health and ecological balance in agricultural systems.

2. Understand how sustainable agriculture farmers function as entrepreneurs in a competitive environment, including the concepts of risk management in an increasingly regulated environment; and

understand the comparative agronomic and economic differences between sustainable, transitional, or organic production systems and conventional production and marketing systems.

3. Understand technical management principles and production practices characteristic of sustainable production, including practical approaches to biologically-based soil and plant fertility, composts and other amendments, biorational pest management, machinery, inputs, and equipment, and processing, quality control, and marketing.

4. Understand how to access research results, information sources, practical guidelines, production systems examples, and mentor-trainers from multiple information sources in the sustainability movement.

This summary was prepared by the project coordinator for the 1998 reporting cycle.

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Final Results

EW96-010

Sustainable Arid Lands Grazing Systems: Training for Managers of Public Lands and Preserves

Location:
California

Funding Period:
July 1996 – September 1998

Grant Award:
$29,000

Project Coordinator:
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Major Participants:
Public Land Managers and Educational Providers

Objectives

To train participating Extension and natural resource management personnel to be more effective in working cooperatively with range managers and range least-holders to implement sustainable grazing policies and practices on Western region range lands.

Abstract

The overall goal of this educational project is to promote the adoption of sustainable grazing policies and practices on privately-owned ranch lands, public lands and natural reserves hosting grazing enterprises. The education/demonstration site is a field station of the non-profit membership institution, the Bio Integral Resource Center (BIRC). This 60 acre farm integrates dryland grazing of natural colored merino handspinning-wool sheep guarded by donkeys, cashmere goats, laying chickens, weeding geese, agroforestry plantings, a rainwater-capture and water conservation system, and a small certified organic vegetable production system, managed as part of the education of nearby community high school students.

Grazing related projects on the farm during the last year included the following: evaluating four commercially available portable electric fence systems, two types of permanent fencing systems and two types of chargers used to control dryland grazing sheep and goats; devising and using a simple computerized record keeping system for numbers of animals grazed per unit of time per site; investigating grazing/physical control weed management strategies for starthistle, turkey mullein, goatgrass and foxtail grasses, cocklebur, and horehound (the latter four all producing seeds damaging to the fleeces); and producing, revising, and distributing educational materials on these sustainable grazing and other farming techniques.

An investigation was initiated to learn what this project could contribute not duplicative of the many classes and practical educational materials on controlled grazing (management-intensive) now abundantly available through Cooperative Extension and University personnel. Discussions were held with Cooperative Extension agents and University and public agency range ecologists and range managers including representatives from the U.S. Forest Service, BLM, East Bay Regional Parks and others. A library was assembled of manuals, syllabi, hand-outs, and layman-oriented how-to magazine and newsletter articles. Computerized searches and a database were started on the related scientific literature, which is extensive.

Some key issues that emerged from discussions with professionals were: pressures from anti-grazing (or anti-animal agriculture) public, needs for better fuel assessment in grazing for fire control, and for research on the effects of grazing on plant diversity, conservation of native vegetation, and water quality (including the problem of *Cryptosporidium* contamination). Based on these concerns, a by-invitation planning workshop is scheduled for spring 1998 with range management professionals who provide classes or supervision of controlled (management-intensive) grazing activities on public and private lands. A final workshop will be held in the second week of June which will include results of the yellow starthistle/subclover trials, most visible at that time.

Public education on the critical role played by grazing animals in maintaining grassland diversity may be an important contribution to the further adoption of sustainable grazing. More than 275 adults, (a mix of professionals and general public) 90 college students and 600 school age children (in 21 public school tours) came to learn about sustainable grazing and integrated farm systems at the ranch site in 1997. Tours last from two to four hours and include a short lecture, discussions, and handout materials on all aspects of the farm operation. Two video segments showing sustainable grazing, starthistle suppression and other techniques on the Field Station were filmed by KVIE, Sacramento and broadcast to California valley cities on the prime time program "California Heartland."

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In the initial development of this system we had help from Dave Pratt, Extension Advisor for Yolo and Solano Counties. Pratt helped us extablish a "kiwi" fencing system which is the most effective of the electric systems we tested. The sheep graze on pastures of annual grasses and yellow starthistle, green from January to June, then dry until the rains in December. We have assisted Craig Thomsen of the Department of Agronomy and Range Science, University of California at Davis (UCD), on the starthistle/mowing/subclover trials. Grazing animals are closely integrated into the other systems on the farm.

The principle noxious weed at the Field Station is yellow starthistle. We have continued to collaborate with Craig Thomsen in his studies on using sheep, sub-clovers, and mowing to suppress starthistle.

However, increasingly we have felt the starthistle on the Field Station offers a benefit to the sheep and this has left us ambivalent about its control. During the summer and fall the dry seedheads are relished by sheep and provide nutrition when little else is left on the pastures. It does not appear to harm the donkeys. We contacted veterinarians at UCD Veterinary School, Texas A&M, and the American Donkey and Mule Society, and have not been able to find anyone who knows of a case of donkey pathology where starthistle was implicated.

We have increasingly focused on weeds with seedheads that become a problem because they embed themselves in the wool. These are horehound, *Marrubium* sp., cocklebur, *Xanthium strumarium*, and various dried grass heads (primarily foxtail barley, *Hordeum* sp., barb goatgrass, *Aegilops* sp.). Cocklebur is primarily a problem around the pond and each year's sprouts can be eliminated with a weed whip. Horehound can be hand pulled except when it is entwined in fences. The grasses with problem seedheads are bag-mowed when heads dry and before they fall. The seeds are fed to the chickens. A foxtail-suppression experiment, in which a small pasture was over-seeded with lana vetch and oats, was successful in suppressing the foxtail, but not deemed practical for other areas because of the irrigation necessary to start germination in the fall. Lana vetch has been seeded in the pastures and now self propagates.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

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Final Results

EW96-011

Professional Training in Biologically Integrated Orchard Systems

Location: California

Funding Period: July 1996 –

Grant Award: $77,970

Project Coordinator:
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Objectives

This project has three objectives:

1. To develop the capacity of Natural Resources Conservation Service (NRCS), University of California Cooperative Extension (UCCE) personnel, and other agricultural professionals to understand and promote successful biologically integrated almond production principles and practices.

2. To develop training for agency personnel and agricultural professionals based on a participatory-learning model and evaluate its suitability for use in other regions.

3. To stimulate hands-on educational events for farmers and other members of the agricultural community to be organized and led by those trained in the mini-courses.

Abstract

In this project, the Community Alliance with Family Farmers (CAFF) took the technical information used in its pesticide reduction program, Biologically Integrated Orchard Systems (BIOS), and developed curricula for use in two training workshops for agricultural professionals. Both the fall and spring workshops were offered in two locations in 1998. Each of the four workshops was attended by approximately 20 to 24 participants.

BIOS is a demonstration program for almond and walnut orchards that offers technical assistance to farmers who want to reduce their synthetic pesticide and fertilizer use. Its methods rely on natural predator/prey relationships for pest control and on natural fertilizers. We developed training in these methods for agency personnel, particularly for USDA Natural Resources Conservation Service (NRCS) and University of California Cooperative Extension (UCCE), because there is no other professional training available in biologically integrated methods. By filling this void, the project helped ensure that farmers who seek information on reduced-chemical farming systems will be served by agricultural professionals who are informed about these methods and can offer them the support they need to adopt such practices.

The project sponsored by USDA SARE over the last eighteen months enabled CAFF to train agricultural professionals in the biologically integrated management approach promoted by BIOS. This project was prompted by the recognition that most agricultural and natural resource agency personnel have received no training in biologically integrated farm systems, those that rely primarily on natural predator-prey relationships for pest control and on compost and nitrogen-rich 'cover crops' for fertilizers. Without this training, these professionals are not able to advise farmers in non-chemical alternatives to pesticides and fertilizers.

While BIOS provides high-quality technical information that is not consistently available from any other source, it also offers this information in a unique forum, wherein farmers, researchers, pest control advisors, and agency personnel are each accepted as valuable contributors to discussions. This approach stands in contrast to the top-down mode of instruction by experts presented by traditional agricultural institutions. We have found that by creating a "level learning field" farmers are much more likely to learn from each other, pick up usable information, and pass important field realities on to researchers and agency staff. Given that the success of the BIOS program has been at least in part due to its participatory learning style, we modeled this style in our workshops and included it as part of what participants could learn at the workshop.

The spring workshops covered soil quality tests in a BIOS orchard, information resources for sustainable soil management, barn owls for rodent control, IPM monitoring in almonds, cover crop selection and management, and soil quality testing in the field. The fall sessions presented information on fall pest

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control decisions in almonds, cover crop seeding in orchards, biological pest management in grapes, soil biology for perennial crops, compost production and utilization, and new trends in winter almond orchard pest control practices.

Dissemination of findings was part of the project itself, not something accomplished separately as when a research study is published. Reaching the agricultural professional audience and persuading them to participate in the workshops was an integral piece of the project. Our outreach efforts for the recruitment of participants focused on NRCS, based on the advice of the workshop advisory team. CAFF staff members called and wrote letters to NRCS administrators at the state and area levels. Staff also gave presentations at area cluster meetings to District Conservationists who had little or no previous contact with the BIOS program. In addition, CAFF produced brochures for each set of workshops that were sent to about 500 people including all applicable NRCS field offices, University of California Extension offices, and pest control advisors in the BIOS database. Contacts were made in other institutions including the Almond Board of California and the California Environmental Protection Agency.

The curricula we developed for our workshops have been disseminated to approximately half a dozen agricultural professionals who were unable to participate but requested copies of the information binders we created for use at the workshops.

Potential Benefits

First, we are pleased with our ability to present the fundamentals of biologically integrated orchard management in written form and through hands-on demonstrations. As was discussed above, this information is not available through the usual channels of continuing education for agricultural professionals. We believe that this information was successfully transferred to participants and they will now be better equipped to promote sustainable alternatives to toxic pesticides and nitrogen fertilizers. The workshops gave those participants who do not interact directly with farmers (i.e., EPA personnel) an introduction to the viability of sustainable farming methods. As a result of this training they will be better prepared to serve as cooperators or funders of sustainable agricultural programs and projects.

Second, the workshops offered participants a rare opportunity to interact with farmers, farm advisors, and independent farm consultants who are experienced with biologically integrated practices. At the workshops participants were encouraged to ask questions of these presenters, who supplied not only technical information, but gave anecdotes of their personal experience with the methods. This was helpful in bringing the technical information to life and grounding it in the reality of farm production. The project created a pathway for sharing information learned in the field with agriculture-related agencies.

Finally, the workshops gave participants a chance to network with each other. The small-group sessions within the workshops allowed people from different organizations to interact and strengthen their relationships.

Impacts on Agricultural Professionals

At the conclusion of each workshop, participants were asked to complete an evaluation of the event. Their comments revealed that the workshops helped participants acquire new knowledge and skills, and in some cases changed their attitudes toward sustainable agricultural production practices.

For example, after the fall workshops a participant commented that the "quality of the speakers' presentations was outstanding." Another praised the diversity and practicality of the topics presented. In terms of using the information gained at the workshop, participants said they would be "better able to communicate with growers and agribusiness," would "inform growers about alternatives and direct them accordingly," and that the workshop had "helped me understand the issue of dormant spray use and the alternatives available to growers." One participant said that he was interested in starting a program similar to BIOS with peach and apricot growers in his county.

This summary was prepared by the project coordinator for the 1999 reporting cycle.

Western SARE

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Western Region SARE Grants Awarded in 1998

State-by-State or Island Protectorate

Western Region

Sustainable Agriculture Research and Education

STATE	GRANT RECIPIENT	AWARD	SUBJECT
Alaska	**Total Funding for Alaska: $5,000**		
	Vickie Talbot, producer	$5,000	Ligonberries
American Samoa	**Total Funding for American Samoa: $12,731**		
	Ma'ataua Te'o, producer	$2,900	Beef Cattle Pasture Manag.
	Litani Ahoia, producer	$4,646	Nutrition Support Group
	Alosina Toomalatai, producer	$2,210	Eel & Tilapia Farm
	Nikolao Mageo, producer	$2,975	Piggery Deep Litter Syst.
Arizona	**Total Funding for Arizona: $345,392**		
	Robert Kattnig, University of Arizona	$103,000	Indian Range Livestock
	Wallace Tsosie, Navajo Res. Consv. & Devl. (RC&D)*	$52,542	Noxious Weed Control*
	Glenda Davis, producer	$7,000	Navajo Livestock Disease
	Wayne Coates, University of Arizona	$182,850	Cotton, Minimum Tillage
California	**Total Funding for California: $223,772**		
	Milt McGiffen, University of California, Riverside	$130,672	Intensive Desert Vegetables
	David Chaney, UC SAREP*	$80,100	Pest Control Advisor Training*
	Touxia Thaoxaochay, producer	$4,000	Alts. to Methyl Bromide
	Mike & Sandy Smith, producers	$4,000	Solarization for Small Farm Crops
	Aaron Albaugh, producer	$5,000	Goats for Weeds, Agroforests
Colorado	**Total Funding for Colorado: $17,303**		
	James Faughnan, producer	$3,000	Alternative Crop Rotations
	Larry Matschke, producer	$2,938	Biocontrol of Weed Musk Thistle
	Dennis Moeller, producer	$8,700	Cattlemen's Asso. Project
	John Haws, producer	$2,665	Forage, Intensive Winter Grazing
Guam	**Total Funding for Guam: $163,210**		
	Bob Barber, University of Guam*	$41,360	"Portable" Extension Office*
	Farouq G. Abawi, University of Guam	$121,850	Swine Production

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STATE	GRANT RECIPIENT	AWARD	SUBJECT
Hawaii	**Total Funding for Hawaii: $162,040**		
	Craig Elevitch, Permanent Agriculture Resources*	$57,885	Agroforestry in Pacific Islands*
	Richard Bowen, University of Hawaii*	$85,400	Tropical Cover Crops*
	Ronald McKeehan, producer	$4,965	Swine Waste Re-Use for Crops
	Zach Gibson, producer	$5,000	Forage Peanuts for Cattle
	Robert Gann, producer	$3,400	Ag Waste to Plant & Fish Food
	Samuel Okami, producer	$5,390	Free Range Pork
Idaho	**Total Funding for Idaho: $14,910**		
	John O'Connor, producer	$9,910	Nematode Control, Potatoes
	Jim Wiersema, producer	$5,000	Dairy Agroforestry
Montana	**Total Funding for Montana: $124,638**		
	Vern Pluhar, producer	$1,540	Annual Forages, Dryland
	Derek W. Bailey, Montana State University	$115,598	Cattle Selection, Grazing
	Steve McCullough, producer	$7,500	Cull Potato Composting
New Mexico	**Total Funding for New Mexico: $59,361**		
	Macario Herrera, Tierra y Montes Soil & Water Con. Dis.	$49,272	Conservation
	Milford Denetclaw, producer	$3,100	Less Irrigated Water Use, Pastures
	Don Bustos, producer	$4,289	Cover Crops, Vegetables
	John Leaf, producer	$2,700	Catchment System, Dryland
N. Mariana Islands	**Total Funding for N. Mariana Islands: $4,500**		
	Nicolas Songsong, producer	$4,500	Tilapia Production
Oregon	**Total Funding for Oregon: $44,658**		
	Karen Murphy, Northwest Coal. for Alts. to Pesticides	$42,000	Sustainable Potatoes
	Ron Jones, producer	$2,658	
	Early Weaning, Ranching		
Utah	**Total Funding for Utah: $261,044**		
	Schuyler Seeley, Utah State University	$261,044	Less Chemical Use in Orchards
Washington	**Total Funding for Washington: $272,466**		
	Barry C. Moore, Washington State University	$157,721	Natural Buffers, Poplars
	Miles McEvoy, Washington Dept. of Agriculture*	$19,100	Organic Production & Marketing*
	Edward Adams, WSU Cooperative Extension*	$67,500	Alternative Dryland Crops*
	Owen Shaffner, producer	$3,460	Baby Corn, Alternative Crop

1999 Awards

STATE	GRANT RECIPIENT	AWARD	SUBJECT
	Jim Divis, producer	$10,000	Codling Moth, Leafhopper, Apples
	Tim Clark, producer	$3,460	Low-Cost Vacuum Silage
	Woody Deryckx, producer	$8,025	Soil Building, Vegetables
	Fred Barkley, producer	$3,200	Biocontrol of Apple Disease
Wyoming	**Total Funding for Wyoming: $173,979**		
	James M. Krall, University of Wyoming	$173,979	Integrated Crop/Livestock, Legumes

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1999 Awards

Western SARE 1999 Awards

1999 Awards

Western Region SARE Grants Awarded in 1999

State-by-State or Island Protectorate

Western Region
Sustainable Agriculture Research and Education

STATE	GRANT RECIPIENT	AWARD	SUBJECT
Alaska	**Total Funding for Alaska: $6,078**		
	Bob Boyd, producer	$6,078	Late Blight Forecasting
American Samoa	**Total Funding for American Samoa: $14,688**		
	Naotala Toli, producer	$1,400	Canco Hill Screen House
	Ioelu Seve, producer	$3,225	Tilapia Farm
	Mark Kneubuhl, producer	$1,500	Leone Greenhouse
	Matautu Tagoilelagi, producer	$2,463	Fruit Trees
	Juan Chan, producer	$4,500	Self-sustaining Swine
	Roseline Liu, producer	$1,600	Banana Scab Moth
Arizona	**Total Funding for Arizona: $5,000**		
	Woodie Jodie, producer	$5,000	Flour Corn Farming
California	**Total Funding for California: $314, 012**		
	Steve Temple, University of California, Davis	$153,962	Transition to Organic
	Krishna Subbarao, University of California, Davis	$145,750	Broccoli Rotations
	Charmaine Harris, producer	$4,300	Reusing Dairy Waste
	Dana Merrill, producer	$10,000	CCVT Point System
Colorado	**Total Funding for Colorado: $214,858**		
	Abdel Berrada, Colorado State University	$142,380	Dryland Cropping
	Lonnie Jackson, producer	$2,733	Hydraulic Windmill Pump
	Steve Keller, producer	$3,550	Sustainable Sheep
	Jeff Jones, American Farmland Trust*	$66,195	Land Use and Protection*
Guam	**Total Funding for Guam: $158,050**		
	Robert Schlub, University of Guam	$16,000	Sustainability Education
	Mari Manitani, University of Guam	$132,100	Nitrogen Fixing
	David Nelson, producer	$3,950	Tropical Mushrooms
	Loella Armstrong, producer	$6,000	Improving Goat Manag.
Hawaii	**Total Funding for Hawaii: $243, 934**		
	Janice Uchida, Office of Research Services	$146,700	Agronomic Research
	Clyde Fukuyana, Hawaii Ag Research Center	$85,134	Natural Vegetable Prod.

STATE	GRANT RECIPIENT	AWARD	SUBJECT
	Michael Strong, producer	$5,000	Disinfecting Lychee
	Liloa Willard, producer	$2,100	Flower Induction
	David Rotstein, producer	$5,000	Palm Sprouts System
Idaho	**Total Funding for Idaho: $18,090**		
	George Davis, producer	$3,890	Water Diversion Gate
	Richard Nathanson, producer	$4,200	Predatory Mites
	Mir Seyedbagheri, Elmore County Extension*	$10,000	Community Approach, Ag*
Micronesia	**Total Funding for Micronesia: $129,366**		
	Kesewaol Bishop, producer	$3,500	Rehabilitation of Savannah
	Lolita Ragus, College of Micronesia	$27,564	Marketing Strategy
	Robert Bishop, Palau Community Action Agency*	$50,762	Learning through Practice*
	Manuel Duguies, University of Guam*	$47,540	Improving Growth for Swine*
Montana	**Total Funding for Montana: $102,061**		
	Jess Alger, producer	$4,578	No-till Wheat
	Jack McCuin, producer	$10,000	Range Monitoring
	Helen Atthowe, Missoula County Extension Service*	$22,483	Master Gardener Program*
	Marcy Mahr, Alternative Energy Resources Org*	$65,000	Ranch & Farm Improvement*
Nevada	**Total Funding for Nevada: $83,400**		
	Tom Filbin, producer	$3,000	Alfalfa for Grazing
	Susan Donaldson, University of Nevada Coop Ext*	$80,400	Teaching Small Acreage Owners*
New Mexico	**Total Funding for New Mexico: $10,760**		
	Cathy Hope, producer	$5,000	Solar Greenhouses
	James Dangler, producer	$4,000	Bat Predation
	Fatou Gueye, producer	$1,760	Strawberries as Wind Barrier
Oregon	**Total Funding for Oregon: $144,813**		
	John Luna, Oregon State University	$83,929	Insectary Plantings
	Daniel McGrath, Oregon State University	$49,997	Soil Assessment
	Rob Heater, producer	$7,786	Strip-till Systems
	Paul Atkinson, producer	$3,101	Pasture and Livestock

STATE	GRANT RECIPIENT	AWARD	SUBJECT
Utah	**Total Funding for Utah: $117,747**		
	David Vagnoni, Utah State University	$108,755	Lactating Dairy Cows
	Mary Tso, producer	$4,000	Hovenweep Reseeding
	Mike Shepherd, producer	$4,992	Poultry Wastes
Washington	**Total Funding for Washington: $120,796**		
	David Horton, USDA Agriculture Resource Services	$110,497	Pears, Mating Disruption
	Mike Miller, producer	$3,817	Asparagus Cover Crops
	Terry Swagerty, producer	$1,732	Grasshoppers in Trees
	Rebecca Thistlethwaite, producer	$1,750	Solar Greenhouses
	Del Wisdom, producer	$3,000	Burdock, Organic Prod.
Wyoming	**Total Funding for Wyoming: $3,500**		
	Rick March, producer	$3,500	Alfalfa for Ranches

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